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PLANTS OF COAHUILA, EASTERN CHIHUAHUA, AND
ADJOINING ZACATECAS AND DURANGO, II

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TYPHACEAE

Typha truxillensis H.B.K. Nov. Gen. et Sp. 1: 68 (1815).

CHIHUAHUA: 3 mi. west of Camargo, *White*.

Widely distributed in our area along the rivers and elsewhere about permanent water.

NAIADACEAE

Naias guadalupensis (Spreng.) Morong, Mem. Torr. Bot. Cl. 3: 60 (1893).

COAHUILA: Monclova, in the river, *White* 1768. CHIHUAHUA: 3 mi. west of Camargo, *White* 2279.

A submerged aquatic, widely distributed in America.

POTAMOGETONACEAE

Zannichellia palustris L. Sp. Pl. 969 (1753).

COAHUILA: Monclova, *Marsh* 1688.

An aquatic of saline waters, world-wide in distribution.

Ruppia maritima L. Sp. Pl. 127 (1753).

COAHUILA: Laguna de Jaco, washed up on the beach, *Stewart & Johnston* 1978.

A nearly cosmopolitan species, usually in saline waters.

Potamogeton pectinatus L. Sp. Pl. 127 (1753).

Collected in ponds in the Rio Grande bottoms, near San Elizario (*Wright* 1895).

Widely distributed over the world in brackish waters.

Potamogeton illinoensis Morong, Bot. Gaz. 5: 50 (1880).

COAHUILA: Monclova, *Marsh* 1672, det. by E. C. Osgood.

Widely distributed in the United States and ranging south to Central America.

Potamogeton nodosus Poir. in Lam. Encyc. Suppl. 4: 535 (1816).

CHIHUAHUA: Sierra Hechiceros, Rancho Encampanada, along creek, *Stewart* 196; Ojo Caliente, Oct. 16, 1852, *Thurber* 823.

An aquatic, nearly world-wide in distribution.

ALISMACEAE

Echinodorus cordifolius (L.) Gris. Abh. K. Ges. Wiss. Goettingen **7**: 257 (1857).

COAHUILA: Torreon, periodically flooded land, 1898, Palmer 466. CHIHUAHUA: Guadalupe, about pond, Oct. 11, 1852, Thurber 805.

Lophotocarpus calycinus (Engelm.) J. G. Smith, Lophot. U. S. 3 (Sept. 1899).

COAHUILA: Hermanas, Marsh 2260.

Eastern United States west to South Dakota and New Mexico, and south in Coahuila.

Lophotocarpus fluitans (Engelm.) J. G. Smith, Lophot. U. S. 1 (Sept. 1899).

The type of this species, of southern New Mexico and trans-Pecos Texas, was collected by Wright (nos. 1899 and 679) in ponds in the bottom-land of the Rio Grande near San Elizario, Texas.

Sagittaria longiloba Engelm. ex Torr. Bot. Mex. Bound. 212 (1859).

This species has been repeatedly collected in the wet bottom-lands along the Rio Grande between El Paso and old Fort Quitman, Texas. It ranges from central United States south into Mexico. The type came from near San Elizario, Texas.

GRAMINEAE

Bromus Schaffneri (Fourn.) Scribn. & Merr. U. S. Dept. Agric., Div. Agrost. Bull. **24**: 30 (Jan. 1901); Scribn. Bull. Torr. Bot. Cl. **28**: 246 (April, 1901).

COAHUILA: Saltillo, 1898, Palmer 5, 266; Parras, May 15, 1847, Gregg. ZACATECAS: Valley 15 km. west of Concepcion del Oro, Stanford et al. 556.

A common, chiefly ruderal species of central Mexico. Collections have been generally identified as *B. laciniatus* Beal, but that is a montane plant obviously distinct from the weedy species concerned here.

Bromus sp.

CHIHUAHUA: Sierra Organos, 1937, LeSueur 211 in pt.

The collection is similar to the plant of Arizona and New Mexico referred to *B. carinatus*.

Bromus sp.

COAHUILA: Mesa Grande, 40 km. northwest of Hac. Encantada, common in meadows, Stewart 1633; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, Marsh 1439.

Similar to the plants of the Chisos and Davis Mountains of Texas passing as *B. marginatus* and *B. polyanthus*.

Bromus anomalus Rupr. ex Fourn. Mex. Pl. **2**: 126 (1886).

COAHUILA: Sierra del Carmen, Aug. 26, 1936, Marsh 628; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, Marsh 1309; trail between Encantada Mesa and Fresno Mesa, July 20, 1938, Marsh 1399; Sierra Gloria, Marsh 1945, 1947; Carneros Pass area, July 1880, Palmer 1372; Sierra del Pino, La Noria, in shaded arroyo and damp meadow, Johnston & Muller 497, Stewart 1213; Sierra Madera, Cañon Charretera, rocky arroyo in oak belt, Johnston 8926. CHIHUAHUA: Sierra Organos, 1937, LeSueur 211 in pt.

Widely distributed in western United States and south to southern Mexico. A very variable species, particularly in the amounts and distribution of indument. The material from the Sierra del Pino and the Sierra

Madera represents a hairy robust form with broad leaves and a large drooping panicle.

Brachypodium mexicanum (R. & S.) Link, Hort. Berol. 1: 41 (1833).

COAHUILA: Sierra del Carmen, Aug. 26, 1936, *Marsh* 613; Sierras Negras, 9 km. south of Parras, *Stanford et al.* 230.

Coahuila and Nuevo Leon south to Central America. A very variable species with forms differing greatly in appearance, apparently even in a single locality. The cited collections have very narrow leaves and short-awned lemmas.

Festuca ligulata Swallen, Am. Jour. Bot. 19: 436 (1932).

COAHUILA: Mountains 24 km. northwest of Fraile, *Stanford et al.* 405.

A coarser, densely tufted plant, with the spikelets larger than in the type of the species from the Guadalupe Mts., Texas, but apparently better referred to *F. ligulata* than to the more northern *F. Thurberi*.

Poa sp.

COAHUILA: Parras, March 1905, *Purpus* 1112; Sierra de Parras, April 1905, *Purpus* 1146; Sierras Negras, 9 km. south of Parras, *Stanford et al.* 167. ZACATECAS: 15 km. west of Concepcion del Oro, *Stanford et al.* 477.

I am unable to name this species. The collection from the Sierras Negras has been identified as *P. involuta* Hitchc.

Poa sp.

COAHUILA: 6 mi. east of Saltillo, 1880, *Palmer* 1366.

The cited specimen has been identified as *P. Ruprechtii* Peyr.

Poa Bigelovii Vasey & Scribn. Descr. Cat. Grasses U. S. 81 (1885).

COAHUILA: Saltillo, 1905, *Palmer* 532.

Oklahoma and western Texas to southern California and south into northern Mexico. The species has been repeatedly collected about El Paso, Texas, and is to be expected in adjacent northern Chihuahua.

Poa annua L. Sp. Pl. 68 (1753).

COAHUILA: Saltillo, 1905, *Palmer* 711; Saltillo, 1898, *Palmer* 6; Saltillo, *Gregg*.

CHIHUAHUA: Chihuahua, 1908, *Palmer* 28.

A European grass, widely established in the United States and Mexico.

Eragrostis obtusiflora Scribn. U. S. Dept. Agric., Div. Agrost. Bull. 8: 10. t. 5 (1897).

CHIHUAHUA: Margin of Laguna de Santa Maria, April 20, 1852, *Wright* 193 (ISOTYPE); near Laguna Santa Maria, 1899, *Nelson* 6413.

Known only from saline soils in northwestern Chihuahua, southwestern New Mexico, and southeastern Arizona. It much resembles *Distichlis stricta* in general habit.

Eragrostis curtipedicellata Buckl. Proc. Acad. Nat. Sci. Phila. 1862: 97 (1863).

COAHUILA: Don Martin Dam, *Harvey* 932.

Kansas and New Mexico to Texas and northeastern Coahuila.

Eragrostis reptans (Michx.) Nees, Agrost. Bras. 514 (1829).

COAHUILA: Don Martin Dam, mud flats, *Harvey* 927, 928.

Kentucky to South Dakota and Texas, south into northeastern Mexico.

Eragrostis megastachya (Koel.) Link, Hort. Berol. 1: 187 (1827).

COAHUILA: Near Don Martin Dam, *Harvey* 948; Sabinas, *Nelson* 6823 (US); Saltillo, 1898, *Palmer* 389; valley-floor east of Puerto Caballo, near bushes by ephemeral charco, *Johnston* 8330; Sierra Cruces, 4 mi. west of Santa Elena, black loam on flats, *Stewart* 828; north of Sierra Cruces, west of San Rafael, on sabaneta, *Johnston & Muller* 1038; 7 mi. south of Jaco, about mogote, *Johnston & Muller* 1110. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, slopes, *Stewart* 2399; Pirámide, under oak tree on gravelly flat, *Johnston* 8119; 10 mi. southeast of Organos, under bushes at foot of grassy slope, *Stewart & Johnston* 2036A; Cañon del Coyote, 20 km. northwest of Santa Fé, in mogote, *Stewart* 2607; Chihuahua, *LeSueur* 83, 122; 20 km. south of Camargo, arroyo, *Harvey* 1377. DURANGO: Tlahualilo, barren hills, *Pittier* 475 (US).

A European weed, widely introduced in America. Where I have seen this plant in Coahuila and Chihuahua, however, it behaves like an indigenous species, associating with indutable native species and growing with them in remote undisturbed places where a single introduced species is certainly not to be expected.

Eragrostis diffusa Buckl. Proc. Acad. Nat. Sci. Phila. 1862: 97 (1863).

COAHUILA: Saltillo, 1898, *Palmer* 811, 812; 7 mi. south of Jaco, about a mogote, *Johnston & Muller* 1109; Torreon, low ground along the Rio Nazas, 1898, *Palmer* 510. CHIHUAHUA: Pirámide, moist rocky soil, *Johnston* 8137; Ojo Almagre, Sierra Almagre, wet sand in canyon, *Johnston & Muller* 1214; Chihuahua, *Pringle* 416, *LeSueur* 78; 3 mi. north of Charca Piedra, under bushes on silty plain, *Johnston* 7929; Camargo, banks of the Rio Conchos, *Harvey* 1404; 50 km. west of Camargo, *Harvey* 1414; Jimenez, banks of the Rio Florida, *Harvey* 1313.

Central Texas to Arizona and south into northern Mexico.

Eragrostis sp.

COAHUILA: Saltillo, 1898, *Palmer* 376; Sierra del Pino, La Noria, meadows and open hillsides, *Stewart* 1205. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, slopes, *Stewart* 2400; canyon west of Organos, damp gravelly arroyo, *Stewart & Johnston* 2081.

Closely related to *E. diffusa* and perhaps only a form of it, differing in its dense elongate inflorescence. The branches of the panicle are very short and strict and bear crowded strictly ascending spikelets. In typical *E. diffusa* the panicle is open, with elongate spreading branches. I have seen the plant from Coahuila, Chihuahua, trans-Pecos Texas, and New Mexico.

Eragrostis mexicana (Hornem.) Link, Hort. Berol. 1: 190 (1827).

COAHUILA: Monclova, 1939, *Marsh* 1834; Saltillo, 1898, *Palmer* 409—412; Saltillo, 1905, *Palmer* 710; San Lorenzo Canyon, 6 mi. southeast of Saltillo, about old goat pen in canyon, 1904, *Palmer* 398; Chojo Grande, 27 mi. southeast of Saltillo, 1904, *Palmer* 334, 335; Parras, 1880, *Palmer* 1367.

Texas to Arizona and south through Mexico to South America.

Eragrostis neomexicana Vasey, Contr. U. S. Nat. Herb. 2: 542 (1894).

COAHUILA: Sierra del Carmen, El Jardin del Sur, Sept. 3, 1936, *Marsh* 766.

Western Texas to Arizona.

Eragrostis caudata Fourn. Mex. Pl. 2: 115 (1881).

Eragrostis Palmeri Wats. Proc. Am. Acad. 18: 182 (1883).

Eragrostis erosa Scribn. ex Beal, Grasses No. Am. 2: 483 (1896).

COAHUILA: Villa Juarez, 1880, *Palmer* 1368 (type of *E. Palmeri*); Sierra del Pino, La Noria, arroyo banks, *Johnston & Muller* 664; Sierra Cruces, 5 mi. south of Santa

Elena, rocky flat among bushes, *Johnston & Muller* 1378; western base of Picacho del Fuste, brushy rocky slope, *Johnston* 8413; Sierra Madera, Cañon Charretera, edge of thickets on rocky flat, *Johnston* 9062; west end of Sierra Fragua, Aguaje Pajarito, rocky ridge, *Johnston* 8676; high rocky west ridge of Sierra Fragua, north of Puerto Colorado, *Johnston* 8760; Sierras Negras, 9 km. south of Parras, *Stanford et al.* 135. CHIHUAHUA: Sierra Santa Eulalia, Oct. 1885, *Pringle* 415 (isotype of *E. erosa*).

Southern and western Texas south into Chihuahua, Coahuila, and northern Tamaulipas. An isotype of *E. caudata* (from Matamores) at the Gray Herbarium is evidently conspecific with the type of *E. Palmeri*. From isotopic material of *E. erosa* they differ only in their slightly smaller spikelets.

Eragrostis intermedia Hitchc. Jour. Wash. Acad. **23**: 450 (1933).

COAHUILA: Allende, *Marsh* 2237; Sierra del Carmen, Sept. 2, 1936, *Marsh* 800; Santo Domingo, igneous hill, *Wynd & Mueller* 476; Palm Canyon near Muzquiz, *Marsh* 979; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh* 1452; between south end of Hillcoat Mesa and Buena Vista headquarters, July 27, 1938, *Marsh* 1510; Rancho Santa Teresa, south of Castaños, *Wynd & Mueller* 200; Saltillo, 1909, *Arsène*; Saltillo, 1898, *Palmer* 408; Sierra del Pino, La Noria, hillsides and along arroyo, *Johnston & Muller* 498, *Stewart* 1203.

Central Texas west to Arizona and south into northern Mexico. A densely tufted perennial with tall erect culms. Habitually very similar to *E. caudata* but differing in having hairy nodes in the panicle, spreading spikelets, and a more open usually proportionately broader inflorescence. Some of the collections from northeastern Coahuila have rather small spikelets and approach *E. lugens* Nees, a widely distributed species in tropical America, which extends northward through Mexico to eastern Texas.

Monanthochloë littoralis Engelm. Trans. Acad. Sci. St. Louis **1**: 437 (1859).

COAHUILA: 4 mi. west of Cuatro Cienegas, common in strongly saline and gypseous soil on flat, *Johnston* 7129.

This species has been known only from salt marshes about the Gulf of Mexico and along the Pacific coast of Mexico and adjacent United States. The material from Cuatro Cienegas is sterile, but in all vegetative details it agrees with material from coastal salt marshes. The plant grows only a few centimeters high, from well-developed scaly rhizomes, and covers small areas of very saline gypsiferous soil.

Distichlis texana (Vasey) Scribn. U. S. Dept. Agric., Div. Agrost. Cir. **16**: 2 (1899).

COAHUILA: Torreon, large masses on sandy banks of Rio Nazas, 18–24 inches high, with runners rooting at the nodes, Oct. 1898, *Palmer* 507.

A coarse grass with long trailing stolons, growing in sandy places. The species has been collected near the Rio Grande at Presidio and Castolon, Texas, and hence it may be expected in northern Coahuila and northeastern Chihuahua.

Distichlis stricta (Torr.) Rydb. Bull. Torr. Bot. Cl. **32**: 602 (1905).

COAHUILA: Cuatro Cienegas, saline soil, *Johnston* 7125, *Harvey* 1234, *Marsh* 2080; Laguna de Jaco, salt flats at south end of lake, *Johnston & Muller* 1089. CHIHUAHUA: Laguna de Santa Maria, 1899, *Nelson* 6416.

A salt grass widely distributed over western United States and Mexico. It has been collected at many stations along the Rio Grande.

Arundo Donax L. Sp. Pl. 81 (1753).

VERNACULAR NAME: Carrizo.

COAHUILA: Palm Canyon, near Muzquiz, *Marsh* 975; Monclova, 1880, *Palmer* 1345; Monclova, *Harvey* 1132.

Texas to California and southward. A plant of the Old World, now widely established in the warmer parts of America. Well established along the Rio Grande and elsewhere about ponds and streams in our area.

Phragmites communis Trin. Fund. Agrost. 134 (1820).

Collected along the Texan bank of the Rio Grande and hence to be expected in northern Coahuila and Chihuahua. Widely distributed in the warmer parts of the world.

Melica montezumae Piper, Proc. Biol. Soc. Wash. 18: 144 (1905).*Melica alba* Hitchc. Contr. U. S. Nat. Herb. 17: 367 (1913).COAHUILA: San Lorenzo Canyon, 6 mi. southeast of Saltillo, 1905, *Palmer* 551; Sierra Mojada, April 19, 1892, *Jones* 482 (US). CHIHUAHUA: Sierra Santa Eulalia, shaded places, April 6, 1885, *Pringle* 430 (ISOTYPE); Chihuahua, *Wilkinson* (US).

Edwards Plateau and Big Bend, Texas, south into our area. Piper and Hitchcock independently named this species, basing their names on the same group of specimens and indicating the same collections as the type. The species has been taken to be endemic to our area, but Mr. W. S. Boyle, who is monographing the genus, has properly indicated, through his identification of the Gray Herbarium material, that the species is also present in Texas.

Melica nitens Nutt. ex Piper, Bull. Torr. Bot. Cl. 32: 387 (1905).COAHUILA: Along arroyo south and west of Sierra Azul, Buena Vista Ranch, July 8, 1938, *Marsh* 1230, 1260.

Eastern United States west to Kansas and Arizona and south through eastern Coahuila to Nuevo Leon.

Triodia pulchella H.B.K. Nov. Gen. et Sp. 1: 155 (1816).

VERNACULAR NAMES: Zacate borreguerro; Zacate pelillo; Zacaquito.

COAHUILA: Sierra del Carmen, Aug. 29, 1936, *Marsh* 692; between Santo Domingo and Piedra Blanca, open country, *Wynd & Mueller* 496; Cuatro Cienegas, *Marsh* 2050; Puerto del Norte, Cuatro Cienegas, *Harvey* 1204; near Sacramento, gravelly wash, *Johnston* 7085; Saltillo, 1898, *Palmer* 257, 413; 10 mi. east of Fraile, stony bahada, *Johnston* 7307; near Santa Elena, eastern foothills of Sierra Cruces, gravelly flat, *Stewart* 840; Puerto Ventanillas, south of Las Delicias, limestone slope, *Stewart* 2967; Parras, 1880, *Palmer* 1359. CHIHUAHUA: Laguna Santa Maria, *Nelson* 6414; Chihuahua, *LeSueur* 11; 20 mi. south of Camargo, *Harvey* 1399. DURANGO: Torreon, rocky hills, *Hitchcock* 7547 (US); Tlahualilo, barren hills, *Pittier* 480; Cerro San Ignacio, *Purpus* 4616 (US). ZACATECAS: Concepcion del Oro, very common, 1904, *Palmer* 263; valley 15 km. west of Concepcion del Oro, *Stanford et al.* 560; Cedros, footslopes and hills, *Lloyd* 89 (US).

Western Texas to southern Nevada and southern California, south to central Mexico. A common but unobtrusive widely distributed, almost ubiquitous, grass among the desert scrub on dry slopes and in desert valleys. A capable xerophyte that flowers throughout the summer and appears to remain unaffected by long droughts. Although it is frequently locally abundant, horses and cattle ignore it if any other food is available. During

long dry spells the plants appear to become shaggy-white-villous. The shaggy indument disappears after a rain and is apparently composed of myriads of hair-like water-soluble crystals which are products of transpiration.

Triodia pilosa (Buckl.) Merr. U. S. Dept. Agric., Div. Agrost. Cir. **32**: 9 (1901).

COAHUILA: Don Martin Dam, *Harvey* 933; calcareous soil near Piedras Negras, *Pringle* 8306; Puerto Santa Anna, *Marsh* 942; Yerda Spring, *Marsh* 296; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh* 1448; Cañon Espantosa, Sierra San Vicente, *Schroeder* 136.

Kansas and Texas to Nevada and Arizona, south into northeastern Mexico.

Triodia avenacea H.B.K. Nov. Gen. et Sp. **1**: 156 (1816).

COAHUILA: 3 km. southwest of Fraile, in arroyo, *Stanford et al.* 331. ZACATECAS: Concepcion del Oro, stony mesa, 1904, *Palmer* 280; valley 15 km. west of Concepcion del Oro, *Stanford et al.* 561.

Northern Zacatecas and Nuevo Leon southward to central Mexico. A low spreading plant, with stolons.

Triodia grandiflora Vasey, Contr. U. S. Nat. Herb. **1**: 59 (1890).

Triodia Nealleyi Vasey, U. S. Dept. Agric., Div. Bot. Bull. **12²**: t. 36 (1891).

COAHUILA: Saltillo, 1898, stony hillside, *Palmer* 414, 813; Saltillo, 1905, *Palmer* 735; base of mountains 3 mi. southeast of Saltillo, *Johnston* 7252; La Rosa, limestone hills, *Shreve & Tinkham* 9575; hills 20 mi. west of Saltillo, *Shreve & Tinkham* 9824; Sierra Guajes, Cañon Madera, east of Buena Vista, hillside, *Stewart* 1505; Sierra del Pino, rocky crest of ridge west of La Noria, *Johnston & Muller* 602; western base of Picacho del Fuste, rocky slope, *Johnston* 8441; Sierra Madera, Cañon Charretera, ledge on sunny hillside, *Johnston* 9102; San Antonio de los Alamos, top of tuff cliffs, *Johnston* 8253; Sierra Cruces, Cañon Tinaja Blanca, crest of sierras, *Johnston & Muller* 297; eastern foothills of Sierra Cruces, north of Santa Elena, rocky flats, *Johnston & Muller* 1384; west of Santa Elena, sunny hillside, *Stewart* 827. CHIHUAHUA: Sierra Virulento, rocky slope, *Johnston* 8093A; Sierra Santa Eulalia, Aug. 12, 1885, *Pringle* 406. ZACATECAS: Concepcion del Oro, 1904, *Palmer* 265.

Although I am following Hitchcock in delimiting this species, I am convinced that it is an aggregate containing several undifferentiated species. Typical *T. grandiflora* is a plant with the habit of *T. pilosa*, having usually pale well-developed spikelets with acute or subulate lemma-lobes. *Triodia Nealleyi* is a species more closely related to *T. avenacea* and has a spicate crowded inflorescence, in which the individual spikelets are less obvious, smaller, usually reddish, and the lemma-lobes elongate-spreading and obtuse. Both of these forms are present in our area. Plants from Chihuahua and Arizona are distinguishable, but are unnamed. Certain plants from the Sierra Guajes, Sierra del Pino, and Sierra Madera are also separable, but without a name. The aggregate of forms here included ranges from western Texas to Arizona and south in eastern Mexico to Hidalgo and Oaxaca.

Triodia texana Wats. Proc. Am. Acad. **18**: 180 (1883).

COAHUILA: Rio Grande Valley near Piedras Negras, *Pringle* 9019; Allende, *Marsh* 1798; 11 mi. south of Allende, tree-lined arroyo, *Johnston* 7017; Yerda Spring, *Marsh* 286; Monclova, 1880, *Palmer* 1371; near Rancho Teresa, south of Castaños, moist place in desert, *Wynd & Mueller* 178.

Central and southern Texas and northeastern Mexico.

Triodia albescens Vasey, U. S. Dept. Agric., Div. Bot. Bull. **12**: t. 33 (1891).

COAHUILA: Rio Grande Valley near Piedras Negras, Pringle 9023; 21 mi. south of Sabinas, Johnston 7041.

Texas and Kansas to Colorado and New Mexico, south into northeastern Coahuila.

Triodia mutica (Torr.) Scribn. Bull. Torr. Bot. Cl. **10**: 30 (1883).

COAHUILA: Sierra del Carmen, Sept. 13, 1936, Marsh 908; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, Marsh 2270; 2 mi. northwest of Fronteras, road to Natadores, silty *Larrea* desert, Johnston 7174; near Sacramento, silty bajada, Johnston 7091; Santa Teresa, south of Castaños, Wynd & Mueller 196; 3 mi. east of Cuatro Cienegas, rocky bajada, Johnston 7110; between Hac. La Rosa and Hac. Lechuguilla, dry desert, Wynd & Mueller 62; 14 mi. east of Paila, Shreve & Tinkham 9891; hills 20 mi. west of Saltillo, Shreve & Tinkham 9820; mountains west of Saltillo, 1880, Palmer 2020; foothills of the Sierra Cruces north of Santa Elena, stony flats among brush, Johnston & Muller 1016, 1377; western base of the Picacho del Fuste, bushy rocky flat, Johnston 8414. CHIHUAHUA: Sierra Santa Eulalia, dry calcareous soil, Pringle 405; arroyo 20 km. south of Camargo, Harvey 1376. DURANGO: Tlahualilo, barren hills, Pittier 468 (US).

Texas to Arizona and south into northern Mexico.

Blepharidachne Bigelovii (Wats.) Hack. in DC. Monogr. Phan. **6**: 261 (1889).

COAHUILA: Several miles west of Buenavista, on road between San Antonio de los Alamos and Puerto Caballo, banks of gypsiferous shales, small clumps 1-3 inches broad, pale, frequent, leaves very pungent, Johnston 8309; south of Laguna de Leche, confined to gypsiferous shales, rigid, erect, local, leaves pungent, Johnston 8615; northern foothills of the Sierra Cruces, about 10 mi. north of Santa Elena, gypsiferous shales, local, Johnston 9411; east base of Picacho de San José, gypsiferous shales, Johnston 9401. TEXAS: Rustler Springs, Culberson Co., 1928, Cory 1238; rocky hills near Frontera, north of El Paso, in small compact bunches, May 4, 1852, Wright 2028 (TYPE); rocky hills near Frontera, May 4, 1852, Bigelow; Frontera, July 1852, Parry.

Known only from the collections cited. Where I have seen the plant it was confined to thin gypsum seams in Upper Cretaceous shales. Since gypsum is present in the areas in Texas where it has been collected, the probabilities are that the species is gypsophilous. The plant forms very strict stiff tufts less than a decimeter tall. The pale rigid leaves have a pungent tip. Because of its distinctive appearance it is readily recognizable, even in the sterile state.

Cottea pappophoroides Kunth, Rév. Gram. **1**: 84 (1829).

COAHUILA: Sierra Hechiceros, Cañon Indio Felipe, sides of dry arroyo, Stewart 175; gypsum beds in the valley between La Vibora and Matrimonio Viejo, Johnston 9340; 16 mi. south of Laguna del Rey, gypsum plain, Johnston 7816; Rancho Las Uvas, Valle Acatita, frequent on gypsum flats, Stewart 2695. CHIHUAHUA: Chihuahua, rocky hills near Millers Dam, Sept. 12, 1885, Pringle 420; 20 km. south of Camargo, Harvey 1395. DURANGO: Torreon, rocky hill, Hitchcock 7543 (US).

Southern and western Texas to Arizona and south to southern Mexico; also in South America. The type came from Peru. Although obviously not confined to gypsum, the species frequently occurs on gypsum in Coahuila, and where I have seen it, it is locally confined to that substratum. On gypsum the plants form a very dense caudex of stem-bases and cleisto-

genes that becomes 3–7 cm. in diameter, although supporting only a relatively few leafy stems. Plants from other substrata develop very loose caudices or none at all. I can detect no other differences between these plants.

Pappophorum Wrightii Wats. Proc. Am. Acad. **18**: 178 (1883).

COAHUILA: Mt. Carmel Canyon, Rio Grande, *Parry*; Saltillo, in graveyard, 1898, *Palmer* 395; near Rosario, about mogote, *Johnston* 8823; 42 mi. west of Saltillo, *Shreve & Tinkham* 9838; San Antonio de los Alamos, summit of tuff cliffs, gravelly flat, *Johnston* 8256; valley between La Vibora and Matrimonio Viejo, margin of gypsum beds, *Johnston* 9351; Parras, 1880, *Palmer* 1361; Castillon, on gypsum flat, *Johnston & Muller* 1269; north of Sierra Cruces, sabaneta west of San Rafael, *Johnston & Muller* 1039; gypsum ridge east of Laguna de Jaco, *Stewart & Johnston* 1965. CHIHUAHUA: Pirámide, gravelly flat under liveoak, *Johnston* 8116; San José del Progreso, south end of Sierra Seca, gypsum flats, *Stewart* 2324; Charco de Grado, Oct. 1852, *Thurber* 825; Chihuahua, *LeSueur* 45; Jimenez, banks of the Rio Florido, *Harvey* 1329; 6 mi. west of Piloncillo, lava hillside, *Johnston* 7876.

Central Texas to Arizona and south to Oaxaca; western South America. As with *Cottea*, this grass, although not restricted to gypsum, is encountered most frequently about gypsum beds and usually in greater abundance there than on other substrata.

Pappophorum mucronulatum Nees, Agrost. Bras. 412 (1829).

COAHUILA: Cuatro Cienegas, *Marsh* 2048; west of Puerto de las Monjas, mouth of arroyo, *Johnston* 8641; Saltillo, dry ground near irrigated field, *Hitchcock* 450; Saltillo, common in graveyard, 1898, *Palmer* 377; near La Rosa, *Shreve & Tinkham* 9904; Parras, 1880, *Palmer* 1360.

Texas to Arizona and northern Mexico.

Pappophorum bicolor Fourn. Mex. Pl. **2**: 133 (1886).

COAHUILA: Don Martin Dam, *Harvey* 939; 21 mi. south of Sabinas, bank of arroyo, *Johnston* 7047; Hermanas, *Marsh* 1591; Monclova, 1880, *Palmer* 1362; near Rancho Santa Teresa, south of Castaños, *Wynd & Mueller* 203; hills 20 mi. west of Saltillo, *Shreve & Tinkham* 9834; on plain 1 mi. south of Ocampo, in mogote, *Johnston* 8885; 7 mi. south of Jaco, near mogote, *Johnston & Muller* 1107.

Texas to Arizona and south into northeastern Mexico.

Scleropogon brevifolius Phil. Ann. Univ. Chile **36**: 206 (1870).

VERNACULAR NAMES: Colo del Zorro; Zacate del Burro.

COAHUILA: Sierra del Carmen, Sept. 13, 1936, *Marsh* 898; Muzquiz, *Marsh* 1118; Saltillo, colonies in depressions on mesas, 1898, *Palmer* 386; Chojo Grande, 27 mi. southeast of Saltillo, level places on mesas, 1904, *Palmer* 340; Parras, Oct. 1910, *Palmer* 5005. CHIHUAHUA: Candelaria, *Stearns* 254 (US); Villa Ahumada, *LeSueur* 72; Santa Eulalia Plains, 1885, *Wilkinson* (US); 15 km. south of Camargo, *Harvey* 1401, 1402. ZACATECAS: Cedros, *Lloyd* 169 (US).

Western Texas to Colorado and Arizona and south to southern Mexico; Argentina. A common and characteristic grass of the silty valley soils in Coahuila, especially of the flat area where some run-off temporarily accumulates during rains. Frequently associated with tobosa (*Hilaria mutica*) and common about the margin of well-developed tobosa flats. The sabanetas of Coahuila, level grassy places of varying size scattered in the desert scrub on the gentle slopes of the major valleys or in the broad open canyons, are usually dominated by this grass. The plant spreads by rhizomes and

large areas may be covered by a pure colony of the plant. The awns are usually stramineous but occasional plants have the awns pink and so permit an observer to determine the extent of an individual plant in the colony. I have noted plants covering three or four square meters and so dominating its particular area that adjoining plants of the species scarcely transgress upon it. The plants are extremely prolific and during the summer the female plants are a mass of fruiting inflorescences; although useless as animal food, they are an attractive element in the desert scene.

Agropyron sp.

COAHUILA: Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1304*; Sierra Gloria, *Marsh 1949*.

The cited specimens belong to the group of *A. arizonicum* and *A. spicatum*, but differ from them in their large, elongate, attenuate, awn-tipped glumes.

Elymus canadensis L. Sp. Pl. 83 (1753).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 529*; Sierra del Carmen, Aug. 9, 1936, *Marsh 635*; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1440*; Saltillo, in orchard, 1898, *Palmer 260*; Saltillo, frequent, July 16, 1848, *Gregg 263*. CHIHUAHUA: 5 km. west of Camargo, *Harvey 1406*.

Widely distributed in the United States, extending south into Chihuahua, Coahuila, and Nuevo Leon.

Sitanion Hystrix (Nutt.) J. G. Smith, U. S. Dept. Agric., Div. Agrost. Bull. **18**: 15 (1899).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh 788*; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1312*; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1436*; north end of Carneros Pass, infrequent, tufts among cacti, spikes nodding, *Johnston 7290*. ZACATECAS: 15 km. west of Concepcion del Oro, 18–30 inches tall, *Stanford et al. 555*.

Western United States and adjacent Mexico; south along the eastern Sierra Madre to central Mexico.

Koeleria cristata (L.) Pers. Syn. Pl. **1**: 97 (1905).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 539*; Sierra del Carmen, Aug. 26, 1936, *Marsh 631*; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1315*; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1445*; Sierra Gloria, *Marsh 1902, 1944*.

Widely distributed in the United States; in Mexico extending south in the mountains to Central America.

Sphenopholis obtusata (Michx.) Scribn. Rhodora **8**: 144 (1906).

COAHUILA: Rio Grande Valley at Piedras Negras, April 17, 1900, *Pringle 8285*.

Widely distributed in the United States and south to southern Mexico.

Trisetum deyeuxioides (H.B.K.) Kunth, Rév. Gram. 102 (1829).

Hitchcock, Contr. U. S. Nat. Herb. **17**: 325 (1913), reports a collection of Pringle (no. 1432) from wet banks of a stream in the Mapula Mts. In his published diaries Pringle mentions collecting the species in the Mapula Mts. on Oct. 30, 1886. The species is known from the mountains of Chihuahua and south to southern Mexico.

Avena fatua L. Sp. Pl. 80 (1753).

COAHUILA: Saltillo, old field, April 1898, *Palmer* 8.

A European weed, widely introduced in the United States and Mexico.

Danthonia mexicana Scribn. Proc. Acad. Nat. Sci. Phila. **1891**: 301 (1891).

COAHUILA: West base of Picacho del Fuste, coarse tufts on limestone ledges on north slope, *Johnston* 8382; Carneros Pass, limestone ledges, Sept. 20, 1890, *Pringle* 3279 (ISOTYPE); Sierra de Parras, April 1905, *Purpus* 1125 in pt.

A rare species, known only from the stations cited above, and from Tehuacan, Puebla.

Agrostis semiverticillata (Forsk.) C. Chr. Dansk. Bot. Arkiv **4**: 12 (1922).

COAHUILA: Muzquiz, Sabinas River, 1936, *Marsh* 410; Muzquiz, 1938, *Marsh* 1157, 1169; Hermanas, 1939, *Marsh* 1621; Monclova, 1939, *Marsh* 1697; Saltillo, 1905, *Palmer* 527; Saltillo, 1898, *Palmer* 806; San Juan de la Vaqueria, May 25, 1847, *Gregg* 711; Parras, 1880, *Palmer* 2019; Parras, Feb. 1905, *Purpus* 1111. CHIHUAHUA: Chihuahua, low meadows, 1908, *Palmer* 29; Chihuahua, wet river bank in shade, 1908, *Palmer* 160; 2 km. west of Jimenez, *Harvey* 1315.

A species of the Old World, now widely distributed in wet soils in the warmer parts of America.

Agrostis exarata Trin. Gram. Unifl. 207 (1824).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller* 547.

From Alaska south through western United States into northern Mexico.

Agrostis hiemalis (Walp.) B.S.P. Prelim. Cat. N. Y. 68 (1888).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller* 544.

Boreal North America south into the mountains of northern Mexico.

Polypogon monspeliensis (L.) Desf. Fl. Atlant. **1**: 67 (1798).

CHIHUAHUA: 2 km. west of Jimenez, *Harvey* 1317.

A European weed, widely distributed in the United States and northern Mexico.

Polypogon elongatus H.B.K. Nov. Gen. et Sp. **1**: 134 (1815).

COAHUILA: Saltillo, along water in ditch, in garden, 1898, *Palmer* 2. CHIHUAHUA: Presa de Chihuahua, 1936, *LeSueur* 150.

Wet soils from southern Arizona south through Mexico, reaching South America.

Lycurus phleoides H.B.K. Nov. Gen. et Sp. **1**: 142. t. 45 (1815).

Lycurus phleoides var. *glaucifolius* Beal, Grasses No. Am. **2**: 271 (1896).

COAHUILA: Sierra del Carmen, Aug. 14, 1936, *Marsh* 658; limestone hill near Santo Domingo, *Wynd & Mueller* 454; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh* 1274, 1285; Mesa Grande, 40 km. northwest of Hac. Encantada, meadows, *Stewart* 1631; base of mountains 3 mi. southeast of Saltillo, *Johnston* 7250; Chojo Grande, 27 mi. southeast of Saltillo, bunches in sandy gravel in canyon, 1904, *Palmer* 339; Sierra del Pino, La Noria, flats and meadows, *Johnston & Muller* 460, *Stewart* 1210; west base of Picacho del Fuste, banks of cemented gravels, *Johnston* 8444; Sierra Cruces, Cañon Tinaja Blanca, rocky slopes on crest at head of canyon, *Stewart* 1950; San Antonio de los Alamos, gravelly flats above cliffs, *Johnston* 8252a. CHIHUAHUA: rocky hills near Chihuahua, May 28, 1885, *Pringle* 426 (isotype of var. *glaucifolius*); Chihuahua, 1935, *LeSueur* 76. ZACATECAS: Valley 15 km. west of Concepcion del Oro, *Stanford* et al. 476.

Ranging from Oklahoma and western Texas west to Arizona and south

in Mexico to Guanajuato (the type locality), Hidalgo, and Puebla. The species is frequent on rocky soils in our area.

Hitchcock, Contr. U. S. Nat. Herb. **17**: 305 (1913), reports *L. phalaroides* H.B.K. from Cedros, Zac. (*Lloyd* 179). The report needs verification. Perhaps a slender specimen of *L. phleoides* is involved.

Muhlenbergia biloba Hitchc. Contr. U. S. Nat. Herb. **17**: 294 (1913).

Bealia mexicana Scribn. in Hack. True Grasses 103 (1890).

CHIHUAHUA: Hills northwest of Chihuahua, Oct. 7, 1886, *Pringle* 819 (ISOTYPE).

Known from a few stations in Baja California, Chihuahua, and Durango.

Muhlenbergia texana Buckl. Proc. Acad. Nat. Sci. Phila. **1862**: 91 (1863).

CHIHUAHUA: Volcanic hills 20 km. north of Chihuahua, open canyon, in gravel of stream-bed, *Stewart & Johnston* 2139; hills northeast of Chihuahua, wet ledges, Oct. 7, 1885, *Pringle* 399; rocky hills northwest of Chihuahua, gravel bars of stream, Oct. 21, 1885, *Pringle* 400.

Trans-Pecos Texas to Arizona and south along the Sierra Madre, in Chihuahua and Sonora, to Durango.

Muhlenbergia crispiseta Hitchc. No. Am. Fl. **17**: 440 (1935).

CHIHUAHUA: Mapula Mts., thin soil of summits, Nov. 11, 1886, *Pringle* 824.

Known from a few collections in San Luis Potosi and the mountains of Chihuahua.

Muhlenbergia implicata (H.B.K.) Kunth, Rév. Gram. **1**: 63 (1829).

CHIHUAHUA: Portrero Peak, east of Mapula station, rocky banks of stream, Oct. 12, 1886, *Pringle* 818.

North through Mexico to Hidalgo, Durango, and Chihuahua.

Muhlenbergia depauperata Scribn. Bot. Gaz. **9**: 187 (1884).

COAHUILA: Along seepage on limestone ledges at top of escarpment at west side of Potrero de la Mula, locally abundant, depressed, *Johnston* 9250. CHIHUAHUA: Pirámide, shaded crevices at base of large rock-masses, *Johnston* 8122; Sierra Santa Eulalia, thin dry soil of ledges, 1885, *Pringle* 404.

Trans-Pecos Texas to Arizona and south to Central Mexico.

Muhlenbergia arenacea (Buckl.) Hitchc. Proc. Biol. Soc. Wash. **41**: 161 (1928).

COAHUILA: Sierra del Carmen, Sept. 13, 1936, *Marsh* 907; northeastern foothills of the Sierra Cruces, 5 mi. south of San Rafael, silty flat in arroyo, *Johnston & Muller* 1032; 3 mi. east of San José, silty flats, *Johnston* 8217. CHIHUAHUA: 50 km. north of Jimenez, in arroyo, *Harvey* 1375. ZACATECAS: Valley 15 km. west of Concepcion del Oro, *Stanford et al.* 517.

Western Texas and adjacent New Mexico south into our area.

Muhlenbergia asperifolia (Nees & Meyen) Parodi, Rev. Fac. Agron. Buenos Aires **6**: 117 (1928).

DURANGO: Mapimi, dense masses in bottom of damp arroyo, 1898, *Palmer* 554.

Western United States south into northern Mexico; also in southern South America. The species has been collected along the Rio Grande near El Paso and is to be expected in northern Chihuahua.

Muhlenbergia glauca (Nees) Mez, Rep. Sp. Nov. **17**: 214 (1921).

COAHUILA: Sierra de la Paila, Oct. 1910, *Purpus* 5006; Sierra Madera, Cañon Charretera, gravelly bed of arroyo, one plant, *Johnston* 8906; Sierra del Pino, La Noria,

shaded arroyo-bank, gravelly soil, *Johnston & Muller* 466. CHIHUAHUA: Rocky hills northeast of Chihuahua, cold wet ledges, Sept. 28, 1885, *Pringle* 395.

Trans-Pecos Texas to Arizona and south to central Mexico.

Muhlenbergia Emersleyi Vasey, Contr. U. S. Nat. Herb. **3**: 66 (1892).

COAHUILA: Sierra del Carmen, Aug. 9–26, 1936, *Marsh* 624, 655; trail from southern extremity of Hillcoat Mesa to Buena Vista headquarters, July 27, 1938, *Marsh* 1511; Sierra Madera, Cañon Charretera, bed of arroyo and on rocky flats, *Johnston* 8950, 9072; Sierra Gloria, *Marsh* 1948; San Lorenzo Canyon, 6 mi. southeast of Saltillo, high on canyon side, 1904, *Palmer* 401; Sierra del Pino, La Noria, *Stewart* 1208, *Johnston & Muller* 462, 587. CHIHUAHUA: Encampanada, Sierra Hechiceros, sunny open slopes, *Stewart* 202; Pirámide, sheltered crevices about base of rock-masses, *Johnston* 8118; Organos, rocky open canyon, *Stewart & Johnston* 2066.

Trans-Pecos Texas to Arizona and south to Durango and Hidalgo. A species of the oak-belt, forming coarse clumps in rocky soil, commonly at the edges of thickets or on sheltered arroyo-banks. The material from eastern Coahuila has a denser stiffer plumbeous, rather than pinkish, panicle, and shorter awns than typical *M. Emersleyi*. This aberrant eastern material, well exemplified by *Palmer* 401, may deserve nomenclatural recognition.

Muhlenbergia lanata (H.B.K.) Hitchc. No. Am. Fl. **17**: 459 (1935).

CHIHUAHUA: Rocky hills northeast of Chihuahua, cool slopes, Oct. 10, 1885, *Pringle* 391.

Known from scattered stations in Chihuahua, and from San Luis Potosí to Puebla.

Muhlenbergia abata sp. nov.

Planta perennis gracilis humilis e rhizomatibus gracilibus oriens; caulis numerosissimis gracilibus stricte ramosis saepe 1–3 dm. longis rigidulis laxe decumbentibus vel procumbentibus; vaginis quam internodiis $\frac{1}{4}$ brevioribus vel eis non raro subaequilongis, maturitate solum partem infra medium internodii culmi amplectantibus, margine scabridulis; ligula ad 1 mm. longa apice rotundata basi decurrente; lamina rigidula plus minusve curvata, 3–6 cm. longa, 1–2 mm. lata, saepe arcte involuta, subtus glabra supra minute scabridula; paniculis scabridulis 2–4 cm. longis paucifloris interruptis angustis subspicatis infra medium brevissime stricteque pauciramosis; spiculis ca. 3 mm. longis strictis acutis elongatis 0.3–5 mm. longe pedicellatis; glumis subaequilongis hyalinis pallidis obscure uninervatis acutis 1.8–2 mm. longis; lemmatibus plumbeis obscurissime nervatis elongatis, supra medium sparse minuteque scabridulis, alibi glabris, apice acutis vel breviter sed distinete rostratis.

TEXAS: Big Springs, 1902, *Tracy* 8218; San Elizario, in field, Sept. 26, 1849, *Wright* 746. NEW MEXICO: Cook's Spring, northern Luna Co., Nov. 3, 1887, *Bigelow*; Ft. Bayard Watershed, Grant Co., 1905, *Blumer* 1781; Mangas Springs, 18 mi. northwest of Silver City, Grant Co., *Metcalfe* 774; valley of the Rio Grande 10–100 mi. above El Paso, *Wright* 1982 (TYPE, Gray Herb.). CHIHUAHUA: Chihuahua, Oct. 1935, *LeSueur* 50. SONORA: El Bilito, northeast of El Tigre, Bavispe Area, *Santos* 2134. SAN LUIS POTOSÍ: 14 mi. northwest of Cedral, dense pure colony in depression near road on desert plain, 1938, *Johnston* 7609; valley of San Luis Potosí, 1876, *Schaffner* 1025 in pt.

This is the species accepted as *M. repens* by Hitchcock, No. Am. Fl. **17**: 451 (1935) and Man. Grasses U. S. 362, fig. 737 (1935). As discussed

under the following species, the name "*M. repens*" properly applies to the plant which Hitchcock called *M. utilis*. From the true *M. repens* (that is, *M. utilis*), the present plant differs in its distinctly larger spikelets, scabrid lemmas and pedicels, looser paler acute glumes more than half as long as the lemma, somewhat larger ligule, and coarser stems and leaves. It ranges in western Texas and southern New Mexico south through Chihuahua to San Luis Potosí.

Muhlenbergia repens (Presl) Hitchc. in Jepson, Fl. Calif. **1**: 111 (1912).

Sporobolus repens Presl, Rel. Haenk. **1**: 241 (1830).

Vilfa utilis Torr. Pac. R. R. Rep. **51**: 365 (1857).

Muhlenbergia utilis (Torr.) Hitchc. Jour. Wash. Acad. **23**: 453 (1933).

Vilfa sacatilla Fourn. Mex. Pl. **2**: 101 (1886).

COAHUILA: Parras, May 16, 1847, Gregg; Parras, thick masses on alkali bottom, 1898, Palmer 452. CHIHUAHUA: Valley of the Sacramento near Chihuahua, by stream, Nov. 6, 1885, Pringle 418.

Central Texas, southern California (where probably introduced), Durango, San Luis Potosí, and central Mexico. Hitchcock has treated this plant as *M. utilis*, cf. No. Am. Fl. **17**: 451 (1935) and Man. Grasses U. S. 362, fig. 738 (1935), and applied the name *M. repens* to the plant I have called *M. abata*. The original description of *Sporobolus repens* Presl, and Scribner's illustration, Ann. Mo. Bot. Gard. **10**: 53. t. 30 (1899), of the isotype of Presl's species at St. Louis leave little doubt as to the precise identity of the species. It is obviously one of the forms of *M. utilis* found in central and southern Mexico.

Muhlenbergia montana (Nutt.) Hitchc. Bull. U. S. Dept. Agric. **772**: 145, 147 (1920).

CHIHUAHUA: High summits of the Sierra Santa Eulalia, 1885, Pringle 392.

Western United States south into Chihuahua and Sonora.

Muhlenbergia Porteri Scribn. in Beal, Grasses No. Am. **2**: 259 (1896).

COAHUILA: Don Martin Dam, Harvey 946; 2 mi. northwest of Frontera, road to Natadores, silty *Larrea* desert, culms numerous, tangled, spreading, Johnston 7172; eastern margin of Llano de Guaje, near La Pistola, forming tangled masses supported by bushes in mogote, Johnston & Muller 357, 764; San Antonio de los Alamos, one colony at base of tuff cliffs, Johnston 8265; 4 mi. west of Lag. de Leche, sprawling or vining in protection of shrubs, scattered on shrubby desert hillside, Muller 3285; Torreon, large masses at base of bushes, 1898, Palmer 511. CHIHUAHUA: Presidio del Norte [Ojinaga], July 1852, Parry; Juarez, dry mesa, Sept. 26, 1902, Pringle 11233; Chihuahua, hills and plains, Pringle 478 (US); Parral-Chihuahua road, 10 km. north of Rio San Pedro, Harvey 1430.

Texas and Colorado to California and south into northern Mexico. A common grass in silty valley soils, usually growing in the shelter of bushes. The globose entangled masses of stems, 3–4 dm. in diameter and supported by the shrubbery a meter or more above the ground, are very characteristic features of the mogotes in Coahuila. The plant, when covered with its very abundant open airy purplish panicles, is conspicuous and attractive.

Muhlenbergia arizonica Scribn. Bull. Torr. Bot. Cl. **15**: 8 (1888).

CHIHUAHUA: Rocky hills northeast of Chihuahua, thin dry soil, Sept. 16, 1885, Pringle 402.

Arizona southward in the mountains of Sonora and Chihuahua to Sinaloa and Durango.

Muhlenbergia arenicola Buckl. Proc. Acad. Nat. Sci. Phila. **1862:** 91 (1863).

COAHUILA: Western base of Picacho del Fuste, silty places on slopes, tufted, not common, *Johnston* 8422; tableland north of Cañon del Cuervo Chico, common on wide grassy valley, *Johnston* 8538; between Palos Blancos and San Pedro, east of Cuesta Zozaya, common on grassy valley on tableland, *Johnston* 9273, 9275; foot slopes at mouth of Cañon Santa Cruz, 20 km. south of Ocampo, *Johnston* 9174; 10 mi. east of Fraile, silty place at edge of bahada, *Johnston* 7304; north of Sierra Cruces, about mogote 5 mi. west of San Rafael, *Johnston & Muller* 1042; gypsum ridge east of Laguna Jaco, fairly common, *Stewart & Johnston* 1962; eastern foothills of Sierra Cruces, 8 mi. north of Santa Elena, stony flat, *Johnston & Muller* 1024; 3 mi. east of San José, silty flat about mogote, *Johnston* 8219; San Antonio de los Alamos, flat at summit of tuff cliffs, frequent, *Johnston* 8258; 10–15 km. east of San Antonio de los Alamos, sabaneta, in broad valley, *Johnston* 8288. CHIHUAHUA: 1 mi. east of Pozo de Villa on Coahuilan boundary, silty plain, *Johnston* 8180; 2 mi. south of San Fernando, silty plain, *Johnston* 7938; Chihuahua, plains, *Pringle* 479 (US); arroyo 50 km. north of Jimenez, *Harvey* 1370.

Kansas to Texas and Arizona and south into Zacatecas.

Muhlenbergia setifolia Vasey, Bot. Gaz. **7:** 92 (1882).

COAHUILA: Sierra del Pino, La Noria, banks of arroyo, *Johnston & Muller* 662, 665; escarpment on west side of Potrero de la Mula, rocky sunny ridges, *Johnston* 9243; Sierra Madera, Cañon Charretera, openings in oak-chapparal on rocky flat, frequent, *Johnston* 9061; Saltillo, summit of a stony mountain, 1898, *Palmer* 415; San Lorenzo Canyon, 6 mi. southeast of Saltillo, bunch grass of medium size on canyon side, 1904, *Palmer* 400.

Western Texas south into Coahuila. The species is closely related to *M. rigida* and apparently separable from it by no single character. Its range is mostly just beyond the northern limit of *M. rigida*, but it grows with that species, along the northeastern limits of the latter, in eastern Coahuila. It is a smaller more slender plant than *M. rigida*, with looser tufts of stems and leaves, filiform involute leaf-blades, and narrower fewer-flowered green or brownish (not purple) panicles.

Muhlenbergia rigida (H.B.K.) Kunth, Rév. Gram. **1:** 63 (1829).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh* 719; Mesa Grande, 40 km. northwest of Hac. Encantada, meadows and hillsides, common, *Stewart* 1628, 1630; Sierra del Pino, La Noria, gravelly flats among clumps of scrub oaks, *Johnston & Muller* 659; Puerto San Lazaro, dominant grass on upper slopes, *Muller* 3095; north end of Carneros Pass, among cacti, not common, *Johnston* 7289. CHIHUAHUA: Sierra Organos, south of Organos at base of oak-clad slope, coarse tufts, rocky places, *Stewart & Johnston* 2065; Sierra Santa Eulalia, Sept. 17, 1885, *Pringle* 401.

Trans-Pecos Texas to Arizona and south to Central America. The species appears to be absent in northeastern Mexico and to reach its eastern limit along the western base of the Sierra Madre in Coahuila and Nuevo Leon. It has been collected in Hidalgo. In eastern Coahuila it is connected by intergrades with the closely related and generally more northerly ranging *M. setifolia*.

Muhlenbergia dubia Fourn. ex Hemsl. Biol. Centr. Am. Bot. **3:** 540 (1885).

COAHUILA: Sierra Madera, Cañon Charretera, coarse tufts in rocky arroyo-bottom just below pine-belt, 3–4 ft. tall, *Johnston* 8975, 9069; Saltillo, among large rocks on

outer rim of treeless mountain, 1898, *Palmer* 416; Saltillo, deep ravines, 1898, *Palmer* 379; San Lorenzo Canyon, 6 mi. southeast of Saltillo, high up canyon, large bunch grass, 1904, *Palmer* 399; Chojo Grande, 27 mi. southeast of Saltillo, bunch grass on canyon side, 1904, *Palmer* 341; north end of Carneros Pass, coarse tufts between bushes, *Johnston* 7288. CHIHUAHUA: Rocky hills northeast of Chihuahua, cool slopes, Oct. 20, 1885, *Pringle* 403.

Trans-Pecos Texas to New Mexico and adjoining Mexico, south through Nuevo Leon and eastern Coahuila to eastern San Luis Potosi. The type of *M. dubia* came from the Chinantla, Puebla. I have seen no authentic material and no collections from south of San Luis Potosi. Our plant is the same as the Texan material described as *M. acuminata* Vasey. Perhaps that name is the proper one for our present plant.

Muhlenbergia villiflora Hitchc. No. Am. Fl. **17**: 470 (1935); Johnston, Jour. Arnold Arb. **22**: 155 (1941).

COAHUILA: Locally common on the gypsum ridges east of Laguna de Jaco, *Johnston & Muller* 1074, *Stewart & Johnston* 1963; 10 mi. east of Fraile, abundant on valley floor, local, *Johnston* 7305; 6 mi. north of La Ventura, common on gypsum plain, local, *Johnston* 7642, *Shreve & Tinkham* 9607.

Known only from scattered stations in Coahuila, San Luis Potosi, Nuevo Leon, and southern Tamaulipas, apparently confined to gypsum.

Muhlenbergia parviflumis Vasey, Contr. U. S. Nat. Herb. **3**: 71 (1892).

COAHUILA: Sierra del Carmen, Sept. 9, 1936, *Marsh* 717; Sierra Madera, Cañon Charretera, banks of arroyo in oak-belt, erect, tufted, *Johnston* 9076.

Known from Uvalde, Val Verde, and Jeff Davis Counties, Texas, and from Nuevo Leon and eastern Coahuila.

Muhlenbergia polycaulis Scribn. Bull. Torr. Bot. Cl. **38**: 327 (1911).

CHIHUAHUA: Hills northeast of Chihuahua, cool wet ledges, 1885, *Pringle* 394.

Trans-Pecos Texas to Arizona and south in the mountains of Baja California, Sonora, and Chihuahua to Durango.

Muhlenbergia pauciflora Buckl. Proc. Acad. Nat. Sci. Phila. **1862**: 91 (1863).

COAHUILA: Sierra Mojada, Cañon San Salvador, abundant on slopes, *Muller* 3312.

Trans-Pecos Texas to Arizona and south in the mountains of Baja California, Sonora, and Chihuahua. The type of the species (*Wright* 732) was collected "in declivities in the mountains near El Paso, Sept. 12, 1849."

Muhlenbergia monticola Buckl. Proc. Acad. Nat. Sci. Phila. **1862**: 91 (1863).

COAHUILA: Camp near Mt. Carmel canyon, Oct. 1852, *Parry*; Sierra del Carmen, Sept. 1, 1936, *Marsh* 872; limestone hill near Santo Domingo, *Wynd & Mueller* 453; Muzquiz, *Marsh* 549; Sierra Madera, Cañon del Agua, among rocks in oak-pinyon belt, in lower canyon, *Muller* 3258, 3259; Cuatro Cienegas, *Marsh* 2053; Puerto San Lazaro, rock crevices on dry open slope, *Muller* 3071; Picachos Colorados, base of cliffs, *Johnston & Muller* 143; Sierra Cruces, eastern foothills near Santa Elena, among bushes along arroyo, *Johnston & Muller* 238; Sierra Cruces, Cañon Tinaja Blanca, about rock ledges on crest at head of canyon, *Johnston & Muller* 298; Sierra Mojada, Cañon San Salvador, abundant on slopes, *Muller* 3312. CHIHUAHUA: Sierra San Carlos, base of limestone cliffs, *Johnston & Muller* 46; near Rancho Madera, southwestern base of Sierra Rica, confined to small gypsum outcrop on slope, *Stewart* 2434; volcanic neck east of El Coyote, base of cliff, *Johnston & Muller* 1411; Sierra Almagre, among rocks in deep shaded canyon, *Johnston & Muller* 1177; Sierra de los Organos, 1937, *LeSueur*; Sierra Santa Eulalia, 2 km. north of San Antonio, *Harvey* 1513; Sierra Santa Eulalia, dry limestone ledges, Aug. 1885, *Pringle* 396.

Trans-Pecos Texas to Arizona and south into northern Mexico. In its extreme form, typical *M. monticola* is separated from typical *M. tenuifolia*, of central Mexico, by having narrow inflorescences with strict branches, strict spikelets, and green acute lanceolate glumes. *Muhlenbergia tenuifolia* has purple inflorescences, which have spreading or ascending branches on which the spikelets are divaricate or even reflexed. Its glumes are deep purple, smaller than in *M. monticola*, and commonly denticulate and obtusish and abruptly apiculate at the apex. In our area, the ranges of *M. monticola* and *M. tenuifolia* meet and the species intergrade very badly. I have arbitrarily referred to *M. monticola* those plants with narrow green or weakly purplish inflorescences (i.e., those with strict panicle-branches and strict spikelets), and to *M. tenuifolia* those plants having a usually darkly colored panicle with spreading branches and spikelets.

The type of *M. monticola* (Wright 731) was collected in Limpia Canyon in the Davis Mts., Texas. This typical form has been illustrated by Hitchcock, Man. Grasses U. S. fig. 788 (1935). Very similar plants have been collected elsewhere in trans-Pecos Texas. Material from Arizona, however, differs in having a distinctly looser panicle. Vasey, U. S. Dept. Agric., Div. Bot. Bull. 13¹: t. 19 (1892), has an illustration (sub *M. calamagrostidea*) of the Arizonan form. From Arizona this aberrant form extends south into the Sierra Madre of Sonora and Chihuahua, where the inflorescence becomes larger and more open and the spikelets divaricate or even reflexed. These large plants, except for the green, not purple, panicles, are remarkably similar in gross aspect to some forms of *M. tenuifolia* from about Mexico City, the type locality of that species. It is clear that the two species, *M. monticola* and *M. tenuifolia*, intergrade in the northern states of Mexico and that, if they are both to be recognized, this can be justified only for convenience and performed in an arbitrary manner.

***Muhlenbergia tenuifolia* (H.B.K.) Kunth, Rév. Gram. 1: 63 (1829).**

VERNACULAR NAME: Zaca espumilla.

COAHUILA: Mouth of Cañon La Cruz, 20 km. south of Ocampo, gravelly bed of large arroyo, Johnston 9187; Cañon Bocatoche, open arroyo, Muller 3119; La Rosita, Shreve & Tinkham 9591; 2 mi. west of Saltillo, Harvey 1097; Saltillo, edge of garden under trees, 1898, Palmer 393; Sierra Cruces, near Santa Elena, hillsides, Stewart 284; San Antonio de los Alamos, gravelly flat above tuff cliffs, Johnston 8255; Parras, 1880, Palmer 1348; Sierra Parras, Oct. 1910, Purpus 5007; Sierra Negras, 9 km. south of Parras, Stanford et al. 165. CHIHUAHUA: Rocky hills near Chihuahua, May 28, 1885, Pringle 428; hills and plains near Chihuahua, Oct. 23, 1885, Pringle 397. ZACATECAS: Valley 15 km. west of Concepcion del Oro, Stanford et al. 506.

Ranging from central and southern Mexico north into our area. Over most of its range a well marked and readily recognized species, but in our area completely intergrading with the more northern *M. monticola*. The species is a weak perennial and, like *M. monticola*, favors sheltered places at bases of cliffs, along rocky arroyo banks, or on slopes in deep canyons.

***Muhlenbergia elongata* Scribn. in Beal, Grasses No. Am. 2: 251 (1896).**

CHIHUAHUA: Rocky hills east of Chihuahua, ledges, 1885, Pringle 398 (ISOTYPE).

Known only from near Chihuahua and from extreme southwestern parts of the state (Palmer 159).

Muhlenbergia Marshii sp. nov.

Planta perennis; culmis ca. 1 m. altis erectis teretibus glabris dense caespitosis simplicibus, basi ad 3 mm. crassis, internodiis 1–1.5 dm. longis; vaginis internodia 3–5 cm. longe superantibus scabridulis; ligulis 1–1.5 mm. longis truncatis glabris; laminis 15–40 cm. longis 2–4 mm. latis involutis rigidulis utrinque scabridulis; panicula spiciformi 2.5–4 dm. longa 3–6 mm. crassa, haud vel vix interrupta, basi e vagina superiore saepe haud exserta, ramis infra medium paniculae 2–4 cm. longis strictis multifloris; spiculis strictis 0–0.5 mm. longe pedicellatis (aristis glumarum exclusis) ca. 4 mm. longis; glumis subaequalibus 3 mm. longis pallidis subhyalinis obscure medio-nervatis (nervis prominentulis scabridis) lanceolatis, paulo supra basim latioribus deinde sursum in aristam rectam 0.3–0.7 mm. longam gradatim contractis, vel non raro summum ad apicem basim aristae minutissime obscurissime truncatis vel emarginatis et lacerato-denticulatis; lemmatibus (aristis rectis ad 0.5 mm. longis exclusis) ad 4 mm. longis glumas evidenter superantibus brunnescentibus supra medium 0.4–0.6 mm. latis deinde sursum gradatim attenuatis, sparse minutissime strigosis sublevibus 3-nervatis basi breviter perinconspicueque adpresseque villosis.

COAHUILA: Sierra del Carmen, Sept. 8, 1936, E. G. Marsh Jr. 746 (TYPE, Gray Herb.). TEXAS: Davis Mts., H. O. Canyon above Sawtooth, soil in cracks of rocks in stream-bed, tough tightly rooted clumps, July 1936, Hinckley.

A member of the species-complex passing as *M. rigens*, among the members of which it is readily distinguished by its short-awned glumes and lemmas and extreme eastern occurrence. The basal portion of the inflorescence bears elongate strict branches and is not exserted from the uppermost leaf-sheaths. In these characters it agrees with true *M. rigens* of central California and closely related forms from southern California and southern Arizona and adjacent Mexico. True *M. rigens* has a somewhat interrupted inflorescence composed of rather elongate strict branchlets, and it appears to be confined to western middle California.

Muhlenbergia mundula sp. nov.

Planta perennis; culmis ca. 1 m. altis erectis teretibus glabris dense caespitosis simplicibus basi ad 3 mm. crassis, internodiis 1–1.5 dm. longis; vaginis saepe scabridulis quam internodiis saepe 1–5 cm. longioribus; ligulis 1–1.5 mm. longis truncatis vel rotundatis; laminis 8–30 cm. longis 2–4 mm. latis involutis rigidulis; panicula spiciformi 15–30 cm. longa densa 4–9 mm. crassa haud interrupta, e vaginis superioribus evidenter exserta, ramulis inferioribus brevibus 5–15 mm. longis strictis multifloris; spiculis strictis 0–5 mm. longe pedicellatis; glumis 2–3 mm. longis pallidis vel plumbeis subhyalinis obscure medio-nervatis, oblongis vel lanceolatis, apice acutis vel obtusis vel erosis raro attenuatis; lemmatibus 3–4 mm. longis 3-nervatis non raro scabridulis, supra basin latioribus deinde apicem versus gradatim attenuatis muticis.

COAHUILA: Sierra Hechiceros, Cañon Indio Felipe, side of dry arroyo, common, Stewart 174. CHIHUAHUA: Rancho El Pino, 10 km. southeast of Sierra Rica, rocky slope, frequent, Stewart 2407; by streams near Chihuahua, Oct. 13, 1885, Pringle 417 (TYPE, Gray Herb.); Quicorichi, Rio Mayo, Gentry 1931; southwestern Chihuahua, 1885, Palmer 21. SONORA: Cañon Bellota, Sierra Cabellera, Bavispe Area, Santos 2096. NEW MEXICO: Berendo Creek, Black Range, Sierra Co., Metcalfe 1391. ARIZONA: Chiricahua Mts., Rigg's Ranch, Blumer 1491; Pinal Creek, Miami, Harrison &

Kearney 6342; Mule Mts., Gooodding 907; Rincon Mts., Manning Camp, Blumer 3397; White Mts., Griffiths 5445.

This species includes most of the plants of Arizona, New Mexico, and northern Mexico which have passed as *M. rigens*. The plant illustrated by Hitchcock, Man. Grasses U. S., as *M. rigens* belongs to *M. mundula*. It is readily distinguished from true *M. rigens* of central California, and from closely related unnamed forms from southern California and southern Arizona, by having the spike well exserted from the upper leaf-sheaths and by having the lower branches of the panicle only 5–15 mm. rather than 20–30 mm. long. In appearance the species much resembles *M. leptoura*, of northwestern Chihuahua, but it differs from that species in having the glumes distinctly shorter than rather than equalling or surpassing the lemma.

Blepharoneuron tricholepis (Torr.) Nash, Bull. Torr. Bot. Cl. **25**: 88 (1898).

CHIHUAHUA: Mapula Mts., thin soil on summits, Oct. 26, 1886, Pringle 822.

Colorado and Utah south through Arizona, New Mexico, and trans-Pecos Texas into the mountains of northern Mexico. The species is known from the Davis, Chinati, and Chisos Mountains of Texas and is, accordingly, to be expected in the mountains of northern Coahuila and northeastern Chihuahua.

Sporobolus microspermus (Lag.) Hitchc. Jour. Wash. Acad. **23**: 453 (1933).

COAHUILA: San Antonio de los Alamos, colony in loose gravelly soil on flats above tuff cliffs, Johnston 8244. CHIHUAHUA: Near Rancho El Pino, 10 km. southeast of Sierra Rica, rocky slope, Stewart 2411; Los Medanos, 1935, LeSueur 74.

As currently accepted, this species ranges in western United States and south to Costa Rica. A critical study will probably show it to be an aggregate of several well-marked species of limited distribution. Hitchcock, Contr. U. S. Nat. Herb. **17**: 308 (1913), sub *S. ramulosus*, reports the plant from the Sierra Santa Eulalia and from near Chihuahua.

Sporobolus pyramidatus (Lam.) Hitchc. U. S. Dept. Agric., Misc. Pub. **243**: 84 (1936).

Sporobolus pulvinatus Swallen, Jour. Wash. Acad. **31**: 351 (1941).

COAHUILA: South of Laguna de Leche, saline and perhaps gypseous silt in mogote, Johnston 8626; Saltillo, along ditch, Hitchcock 5580 (US). CHIHUAHUA: 5½ mi. south of Ojinaga, outwash from saline and gypseous shales, Johnston 8005; sandy plains near Chihuahua, Sept. 22, 1886, Pringle 816. DURANGO: Flats on plains 3 mi. northeast of Bermejillo, Johnston 7787.

Texas and Oklahoma to Arizona and south into Mexico; South America.

Sporobolus airoides Torr. Pac. R. R. Rep. **7**: 21 (1858).

COAHUILA: 4 mi. west of Cuatro Cienegas, coarse tufted grass on alkaline flat, Johnston 7133; Laguna de Jaco, saline meadow south of the lake, abundant, coarse tufts, Johnston & Muller 1102. CHIHUAHUA: Villa Ahumada flat, 1935, LeSueur 71.

Widely distributed in saline soils in western United States and extending south into northern Mexico.

Sporobolus regis sp. nov.

Planta robusta ca. 12 dm. alta e rhizomate elongato nodoso (internodiis 10–12 mm. longis) 3–4 mm. crasso oriens; culmis simplicibus erectis con-

fertis foliosis; vaginis quam internodiis saepe subaequilongis vel usque ad 1 cm. brevioribus, extus pilis numerosis gracilibus 1–2 mm. longis adpressis pallide flavescentibus donatis, vetustioribus glabrescentibus; ligula subnulla 0.3 mm. longa vel breviore fimbriata vel dense et minute ciliolata; laminis 1.3 dm. longis 3–4 mm. latis saepe laxe involutis, subtus levibus, supra pallidioribus minute scabridis; paniculis apertis 3–4 dm. longis ad 15 cm. crassis, basi e vagina superiore haud exsertis, ramis alternis 2–12 mm. distantibus ramulosis adscendentibus vel laxe adscendentibus 5–10 cm. longis, axillis villosis, ramulis laxe adscendentibus saepe purpureis; spiculis 2–2.5 mm. longis glaberrimis unifloris, pedicellis strictis 1–5 mm. longis; gluma exteriore 1.2–1.5 mm. longa hyalina late lanceolata acuta, supra basim in medio purpurea; gluma interiore 1.5–1.8 mm. longa hyalina lanceolata enervata acuta; lemmate hyalino lanceolato-elliptico obscure uninervato, apice late acuto, longitudinem paleae aequante.

COAHUILA: Salt flat 4 km. southeast of Laguna del Rey, abundant, Sept. 18, 1942, Stewart 2653 (TYPE, Gray Herb.).

A very well marked species, probably most closely related to *S. airoides* Torr. and *S. Wrightii* Munro. From these and most other members of the genus, *S. regis* differs in the very hairy leaf-sheaths, the tufts of hairs in the axils of the panicle-branches, and the very coarse rhizomes. The bases of the culms and the younger nodes of the rhizomes bear shredded remnants of old leaves.

Sporobolus Wrightii Munro ex Scribn. Bull. Torr. Bot. Cl. 9: 103 (1882).

VERNACULAR NAME: Zacaton.

COAHUILA: 5 mi. north of Allende, oak thicket on plain, coarse tufts, culms 3–6 ft. tall, Johnston 7010; open country between Santo Domingo and Piedra Blanca, Wynd & Mueller 497; 20 mi. northwest of La Babia, open valley floor, Wynd & Mueller 449; Santa Anna Canyon, Marsh 495; trail from southern extremity of Hillcoat Mesa to Buena Vista headquarters, July 27, 1938, Marsh 1512; vicinity of Encantada Ranch headquarters and eastward, July 28, 1938, Marsh 1520; Cuatro Cienegas, Marsh 2038, 2081; Cuatro Cienegas, Puerto del Norte, Harvey 1220; Saltillo, in large bunches, dry alkaline clay soil, scarce, 1898, Palmer 1; Llano de Guaje near Tanque La India, the common grass about the bare flats, Johnston & Muller 778; Sierra del Pino, La Noria, large clumps in arroyo, Johnston & Muller 666; between Palos Blancos and San Pedro, road to Cuesta Zozaya, common in grassy valley on tableland, Johnston 9272; Laguna de Leche, the common grass about the margin of the dry lake, Johnston 8601; south of Laguna de Leche, saline soils below outcrops of Upper Cretaceous beds, Johnston 8624; east of Laguna de Jaco, about gypsum beds, 6–10 dm. tall, Stewart & Johnston 1959; Laguna de Jaco, saline soil at south end of lake, Johnston & Muller 1091; 11 km. northeast of Jimulco, Stanford et al. 72. CHIHUAHUA: Presidio del Norte, 6–8 ft. tall, Parry; 11 mi. south of Ojinaga, along small arroyo in low hills, 3–5 ft. tall, Johnston 8034; Pirámide, low ground, heavy soil at edge of cornfield, 3–6 ft. tall, Johnston 8139; Carrizal, Aug. 18 or 19, 1846, Wislizenus 103; Meoqui, 1938, LeSueur 34; 20 km. south of Camargo, Harvey 1396. ZACATECAS: 15 km. west of Concepcion del Oro, Stanford et al. 528; 7 mi. north of San Tiburcio, heavy, probably alkaline soil among mesquites, Johnston 7362.

Trans-Pecos Texas to southern California and south to central Mexico. Hitchcock, Contr. U. S. Nat. Herb. 17: 309 (1913), reports the species from Chihuahua, Torreon, and Saltillo. It appears to be present in most parts of our area. Although I have accepted this species in the broad traditional sense, I suspect that it is an aggregate of several critical species.

The plants I have included in *S. Wrightii* vary greatly in size, appearance, and selection of habitats. The leaves are broad to narrow, dark or pale green, flat to involute. The plants may form large very coarse tussocks over a meter broad, and with culms nearly 2 m. tall, or low clumps 1-2 dm. tall, with the culms much less than a meter in height. The larger plants are mostly from permanently wet soils; the small plants come from the plains where water stands and evaporates after storms. The soils supporting the plant vary from those with no appreciable amount of salt to those with large amounts of alkali and even gypsum.

***Sporobolus cryptandrus* (Torr.) Gray, Man. 576 (1848).**

COAHUILA: Saltillo, sandy field, *Hitchcock* 5625 (US); Tanque Colorado, among bushes on red dunes, *Johnston* 8663; Los Medanos, 1935, *LeSueur* 60, 80; valley near Chihuahua, Oct. 4, 1885, *Pringle* 419.

Widely distributed in sandy places over the United States and south into northern Mexico. The two following species are probably no more than varieties.

***Sporobolus flexuosus* (Thurb.) Rydb. Bull. Torr. Bot. Cl. 32: 601 (1905).**

Sporobolus cryptandrus var. *flexuosus* Thurb. in Wats. Bot. Calif. 2: 269 (1880).

CHIHUAHUA: Los Medanos, 1935, *LeSueur* 80a; between Los Medanos and Samalayuca, sand hills, Sept. 1886, *Pringle* 815; Colonia Diaz, 1899, *Nelson* 6458.

Southwestern United States and northern Chihuahua. Differing from *S. cryptandrus* only in having a more open panicle, with the spikelets and ultimate branchlets spreading rather than appressed along the primary branches of the panicle.

***Sporobolus giganteus* Nash, Bull. Torr. Bot. Cl. 25: 88 (1898).**

Sporobolus cryptandrus var. *strictus* Scribn. Bull. Torr. Bot. Cl. 9: 103 (1882).

Sporobolus contractus Hitchc. Am. Jour. Bot. 2: 303 (1915).

COAHUILA: North end of Cañada Oscuro, gravelly slopes among brush, common, *Johnston* 8460; south of Laguna de Leche, shaly bank among brush, frequent, *Johnston* 8625; Sierra Cruces, 8 mi. north of Santa Elena, stony flat among bushes, *Johnston & Muller* 1027. CHIHUAHUA: Los Medanos, 1935, *LeSueur* 13, 58; 20 km. south of Camargo, *Harvey* 1397.

Southwestern United States and northern Mexico. Probably only a phase of *S. cryptandrus*, with the inflorescence bearing short strict crowded branches and branchlets and accordingly spike-like in form. *Hitchcock* has distinguished the robust plants of this form as *S. giganteus* and the more slender forms as *S. contractus*.

***Sporobolus Nealleyi* Vasey, Contr. U. S. Nat. Herb. 1: 57 (1890); Johnston, Jour. Arnold Arb. 22: 155 (1941).**

COAHUILA: Castillon, confined to gypsum flat, infrequent, *Johnston & Muller* 1268; east of Laguna de Jaco, frequent, confined to gypsum, *Johnston & Muller* 1073, *Stewart & Johnston* 1954; Sierra Cruces, gypsum flats near Santa Elena, *Johnston & Muller* 247; gypsum bed west of Buena Vista, along road between San Antonio de los Alamos and Puerto Caballo, rare, *Johnston* 8314.

Western Texas and eastern New Mexico and south into Coahuila. Apparently confined to gypsum. The type-collection of the species was originally given as collected at "Brazos Santiago, Texas," that is, near the mouth of the Rio Grande, where the species is neither known nor to be

expected. This is apparently the result of a clerical error. Nealley's specimens came from Screw Bean, a locality near the Pecos River, in Reeves County, Texas, where a large variety of gypsophiles has been collected.

Sporobolus spiciformis Swallen, Proc. Biol. Soc. Wash. **56**: 78 (1943).

COAHUILA: Puerto del Norte, Cuatro Cienegas, July 1939, Harvey 1225 (TYPE, U.S.); 4 mi. west of Cuatro Cienegas, common and conspicuous on saline and gypseous flats, 1938, Johnston 7132; 4 km. southeast of Laguna del Rey, abundant on salt flats, 1942, Stewart 2654; Noria de San Juan, southeast of Laguna del Rey, common on saline plain, 1942, Stewart 3008.

Endemic to our area, and apparently confined to saline gypseous soils. The species is most closely related to *S. phleoides* Hack., of saline soils in the deserts of western and northern Argentina. It differs from the southern plant in its paler color, involute leaves, more rigid tighter leaf-sheaths, broader erose or dentate glumes, non-rostrate palea, and much larger anthers.

Oryzopsis hymenoides (R. & S.) Ricker ex Piper, Contr. U. S. Nat. Herb. **11**: 109 (1906).

A widely distributed species of sandy soils in western United States. Hitchcock, Contr. U. S. Nat. Herb. **17**: 285 (1913), reports a collection from "sandhills near Paso del Norte, Pringle 1053."

Piptochaetium fimbriatum (H.B.K.) Hitchc. var. **confine** var. nov.

A forma typica austro-Mexicana glumis viridibus evidenter nervatis haud purpureis differt.

COAHUILA: Sierra del Carmen, Cañon Sentenela, Wynd & Mueller 643; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, Marsh 1284; Sierra Madera, Cañon Charretera, in shade in oak thickets, Johnston 9077; Sierra del Pino, La Noria, in thickets on arroyo-bank, Johnston & Muller 486 (TYPE, Gray Herb.).

Ranging in the mountains along the Mexican Boundary, from trans-Pecos Texas (Chisos and Davis Mts.) west to Arizona, and from Coahuila and northern Nuevo Leon to northeastern Sonora. Typical *P. fimbriatum* comes from central Mexico and differs from our northern plant in having firmer obscurely veined purple glumes and usually less slender and flaccid leaves. Where I have seen the var. *confine* in Coahuila, it has always grown in very sheltered shaded places, usually under bushes in dense oak thickets, and it is seldom common.

Stipa neomexicana (Thurb.) Scribn. U. S. Dept. Agric., Div. Agrost. Bull. **17**: 132 (1899).

COAHUILA: Along trail from southern extremity of Hillcoat Mesa to Buena Vista Ranch headquarters, July 27, 1938, Marsh 1492; tableland north of Cañon del Cuello Chico, basal slopes of low rounded limestone hills, Johnston 8564; north end of Carneros Pass, conspicuous grass among low shrubbery, Johnston 7297.

Western Texas and Colorado to Utah and Arizona and south through Coahuila to the mountains of Nuevo Leon.

Stipa leucotricha Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. **51**: 54 (1842).

COAHUILA: Rio Grande Valley near Piedras Negras, April 17, 1900, Pringle 8292; Muzquiz, Dec. 5, 1936, Marsh 1077; Monclova, Marsh 1691, 1718.

Oklahoma south through central Texas into northeastern Coahuila. The

species appears to differ from *S. mucronata* H.B.K., of central and eastern Mexico, only in the large size of the spikelet and fruit and in the usually green rather than purpurescent glumes. The material from Coahuila and adjacent Texas is distinctly smaller than the typical form of *S. leucotricha*, and some of the specimens have colored glumes.

Stipa eminens Cav. Icon. Pl. 5: 42. t. 467 (1799).

COAHUILA: Limestone hill near Santo Domingo, Wynd & Mueller 460; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, Marsh 1460; Sierra Madera, lower part of Cañon Charretera, open flat, Johnston 9161; near Santa Rosa, limestone hills, Shreve & Tinkham 9576; north end of Carneros Pass, Johnston 7298; Sierra del Pino, La Noria, common grass on flats and meadows, Johnston & Muller 454, 663, Stewart 1207; tableland north of Cañon del Cuervo Chico, gravelly places on low limestone hills, Johnston 8562; Sierra Parras, April 1905, Purpus 1125 in pt.; Sierra Cruces, limestone foothills 8 mi. north of Santa Elena, Johnston & Muller 1026; Sierra Cruces, about volcanic ledges on ridge at head of Cañon Tinaja Blanca, Johnston & Muller 305. CHIHUAHUA: Sierra Santa Eulalia, Aug. 12, 1885, Pringle 384.

Trans-Pecos Texas to Arizona and south to central Mexico. Hitchcock, Contr. U. S. Nat. Herb. 24: 238 (1925), reports the species from Cedros, Zacatecas.

Stipa angustifolia Hitchc. Contr. U. S. Nat. Herb. 24: 246 (1925).

COAHUILA: Saltillo, July 25, 1905, Palmer 626.

This species was based upon a specimen collected by Palmer July 25, 1905, "among rocks on summit of Sierra de la Puebla, near Saltillo." The collection number is given as "Palmer 726." The specimen in the Gray Herbarium, agreeing with the original description, and collected near Saltillo on the same date as the type, bears the number Palmer 626. This species has very slender involute leaves. It has been collected in Nuevo Leon (near Pablillo, Mueller 522) and in southern Tamaulipas (Miquihuana, Stanford et al. 645a).

Stipa clandestina Hackel, Rep. Sp. Nov. 8: 516 (1910).

COAHUILA: Saltillo, alt. 1650 m., March 1908, Arsène 3441 (ISOTYPE); Saltillo, alt. 1600 m., March 1908, Arsène 3467; Saltillo, in large bunches, banks of irrigation ditches, 1898, Palmer 3; Saltillo, dry ground, 1910, Hitchcock 815. ZACATECAS: Valley 15 km. west of Concepcion del Oro, valley floor, 18 in. tall, Stanford et al. 553.

Known only from our area.

Stipa editorum Fourn. Mex. Pl. 2: 75 (1886).

COAHUILA: 10 mi. east of Fraile, abundant and most conspicuous species on silty floor of valley, local, Johnston 7303. ZACATECAS: 7 mi. north of San Tiburcio, heavy soil among mesquites, Johnston 7361.

Known from Coahuila, Zacatecas, Nuevo Leon, southern Tamaulipas, and Puebla. The species may possibly be gypsophilous.

Stipa multinodis Scribn. ex Beal, Grasses No. Am. 2: 222 (1896).

CHIHUAHUA: Sierra Santa Eulalia, Aug. 1885, Pringle 385 (ISOTYPE).

Closely related to *S. editorum*, with which it agrees in the many-noded strict culms 7-12 dm. tall and somewhat fruticulose at the base. It differs in a slightly smaller lemma and nearly absent ligule. The species is known only from the type collection.

Stipa robusta (Vasey) Scribn. U. S. Dept. Agric., Div. Agron. Bull. **5**: 23 (1897).

COAHUILA: Sierra Madera, Cañon Charretera, common in rocky bed of arroyo in oak belt, becoming 4 ft. tall, *Johnston* 9073; Saltillo, 1902, *Palmer* 317; Lirios, 1880, *Palmer* 1249; San Antonio de las Alanzanas, near mountain border, 3 ft. tall, Aug. 31, 1848, *Gregg* 349.

Colorado to Arizona and trans-Pecos Texas, and south through Coahuila to the mountains of Nuevo Leon. A large coarse grass apparently restricted to the oak and lower pine belts. The type came from the Chinati Mts., Texas, and accordingly the species is to be expected in the mountains of northeastern Chihuahua. In the United States this species has been reported to have narcotic effects on animals eating it. In the notes accompanying his collections from the mountains of southeastern Coahuila, cited above, Gregg states that the grass is "very injurious to animals, intoxicating and often killing them. Animals acquainted with it will not eat it."

Stipa tenuissima Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. **2¹**: 36 (1836).

COAHUILA: Sierra del Carmen, Sept. 1, 1936, *Marsh* 878; Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller* 538; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh* 1314; Saltillo, bunches on shady slope of hill, 1904, *Palmer* 455; Saltillo, 1909, rare, *Arsène* 3469; Chojo Grande, 27 mi. southeast of Saltillo, 1904, *Palmer* 341; north end of Carneros Pass, among low bushes, *Johnston* 7296; Carneros Pass, limestone hills, Sept. 20, 1890, *Pringle* 3274.

New Mexico and trans-Pecos Texas south through Coahuila and Nuevo Leon to Puebla; Argentina.

Aristida adscensionis L. Sp. Pl. 82 (1753).

COAHUILA: Sierra del Carmen, July 29, 1936, *Marsh* 675; 21 mi. south of Sabinas, heavy soil, *Johnston* 7043; Santa Anna Canyon, *Marsh* 433; Cuatro Cienegas, *Marsh* 2059 in pt.; Saltillo, 1898, *Palmer* 388; Chojo Grande, 27 mi. southeast of Saltillo, in ravine, 1904, *Palmer* 333; 42 mi. west of Saltillo, *Shreve & Tinkham* 9839; west base of Picacho del Fuste, cemented gravels, *Johnston* 8415; San Antonio de los Alamos, on canyon-wall and on gravelly flats at top of cliffs, *Johnston & Muller* 874, *Johnston* 8252; Las Uvas, east side of Valle Acatita, gypsum in arroyo, *Stewart* 2696; Parras, 1880, *Palmer* 1352; Torreon, 1898, *Palmer* 512. CHIHUAHUA: Los Medanos, 1935, *LeSueur* 36; Chihuahua, 1935, *LeSueur* 3; rocky hills near Chihuahua, Aug. 1885, *Pringle* 390; Sierra Organos, 1937, *LeSueur* 191; 60 km. north of Escalon, *Harvey* 1306.

A variable annual species widely distributed in the warmer parts of America and the Old World. This species has been consistently described as always having the lemma with three awns. Three of the collections cited above (*Pringle* 390, *Johnston* 8252 and 8415) have the lateral awns minute or nearly wanting, but otherwise they agree closely with the specimens associated with them.

Aristida ternipes Cav. Icon. Pl. **5**: 46 (1799).

CHIHUAHUA: Rocky hills northeast of Chihuahua, Aug. 13, 1885, *Pringle* 387; Meoqui, 1936, *LeSueur* 120 in pt.; Meoqui, 1935, *LeSueur* 38.

Ranging from trans-Pecos Texas to Arizona and south through Sonora and Chihuahua; reaching northern South America.

Aristida Schiedeana Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. **5¹**: 120 (1842).

Aristida Orcuttiana Vasey, Bull. Torr. Bot. Cl. **13**: 27 (1886).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller* 607. CHIHUAHUA: Sierra Santa Eulalia, Sept. 10, 1885, *Pringle* 386.

Trans-Pecos Texas to southern California and south to Guatemala. Very closely related to *A. ternipes* and differing from that species chiefly in having the neck of the fruit twisted and bent. Our plants represent the northern phase of the species (*A. Orcuttiana*), which is weakly distinguished from the typical southern phase by usually having glabrous and somewhat firmer, paler glumes.

***Aristida divaricata* H. & B. ex Willd. Enum. Pl. 1: 99 (1809).**

CHIHUAHUA: On the Coahuila boundary 1 mi. east of Poza de Villa, silty plain, *Johnston* 8177; Rancho El Pino, 10 km. southeast of Sierra Rica, rocky slope, *Stewart* 2394; 7 mi. south of Pirámide, silty flat, *Johnston* 8108; 4 mi. southeast of Organos, flats at base of grassy slope, *Stewart & Johnston* 2041.

Western Kansas and western Texas to California and south through Chihuahua and Sonora, reaching Guatemala. Much resembling the two previous species and having a similar very lax panicle with long slender abruptly and widely spreading branches, but differing in having three well-developed awns on the lemma. The collection from near Pirámide has the fruiting lemma with a stout untwisted neck and accordingly belongs to the form distinguished as *A. hamulosa* Henr.

***Aristida longiseta* Steud. Syn. Pl. Glum. 1: 420 (1855).**

COAHUILA: Dry mesas near Piedras Negras, Apr. 23, 1900, *Pringle* 9037; Sierra del Carmen, Aug. 14, 1936, *Marsh* 665; 20 mi. northwest of Hac. La Babia, open valley floor, *Wynd & Mueller* 445. CHIHUAHUA: Los Medanos, 1935, *LeSueur* 57.

Widely distributed in the western United States and extending south into our area. The Coahuilan collections, representing the var. *rariiflora* Hitchc., have smooth lemmas with a stout neck. LeSueur's collection has more attenuate minutely tuberculate lemmas. Hitchcock, Contr. U. S. Nat. Herb. 22: 563 (1924), reports a collection of the species (*Pringle* 473) from near Chihuahua.

***Aristida Roemeriana* Scheele, Linnaea 32: 343 (1849).**

Aristida purpurea var. *micrantha* Vasey, Contr. U. S. Nat. Herb. 3: 47 (1892).

COAHUILA: Allende, *Marsh* 1799; igneous hill near Santo Domingo, *Wynd & Mueller* 468; Zacate, July 14, 1936, *Marsh* 501; Yerda Spring, July 6, 1936, *Marsh* 293; Hermanas, *Marsh* 1586, 1617; Monclova, *Marsh* 1694; Cañon Bocatoche, grassy valley floor, *Muller* 3111; near Rancho Santa Teresa, *Wynd & Mueller* 173, 202, 206; La Rosita, *Shreve & Tinkham* 9593; east of Hac. La Rosa, mountain slope, *Wynd & Mueller* 44; mountains west of Saltillo, 1880, *Palmer* 1351; Saltillo, stony hills, 1898, *Palmer* 392; Sierra Madera, Cañon Charretera, lower canyon, open flat, *Johnston* 9160; mouth of Cañon La Cruz, 20 km. south of Ocampo, base of mountains, *Johnston* 9176, 9178; Cuatro Cienegas, 1939, *Marsh* 2059 in pt.; Sierra Cruces, 8 km. north of Santa Elena, stony flat, *Johnston & Muller* 1015.

A variable and ill-defined species ranging from Texas south through northeastern Mexico to Hidalgo. It is a plant with small spikelets with strongly unequal, usually purpureous, glumes in a rather loose panicle with more or less nodding branches. It intergrades completely with *A. purpurea*, *A. longiseta*, *A. Reverchoni*, *A. curvifolia*, *A. dissita*, and *A. glauca*, all intergrading and variable species, and like them incapable of precise definition. The condition is probably the result of free and much repeated interspecific hybridization and subsequent segregation and re-

combination of characters. Since technical characters of the spikelet are as variable and erratic as those found in the form of inflorescence and the gross aspect of the plant, I have preferred to use these latter in defining the "species" in this most difficult genus of grasses.

Aristida Reverchoni Vasey, Bull. Torr. Bot. Cl. **13**: 52 (1886).

Aristida Nealleyi Vasey, Contr. U. S. Nat. Herb. **3**: 45 (1892).

CHIHUAHUA: Sierra Santa Eulalia, dry ledges, Sept. 8, 1885, *Pringle* 389.

Texas to southern California and south into Chihuahua. A plant with very strict subsessile clusters of spikelets forming a spike about 15 cm. long. The awns are rather slender and usually pinkish. The plant intergrades with *A. Roemeriana*, *A. curvifolia*, *A. longiseta*, *A. dissita*, and *A. glauca*. Hitchcock and Hennard treated this plant as a synonym of *A. glauca*, but that is a plant of eastern Mexico with looser spikelet-clusters and a more interrupted spike, more suggestive of a slender form of *A. curvifolia* than of the present species.

Aristida curvifolia Fourn. Mex. Pl. **2**: 78 (1886).

Aristida Wrightii Nash in Small, Fl. S. E. U. S. 116, 1327 (1903).

COAHUILA: Sierra del Carmen, Sept. 12, 1936, *Marsh* 841; Rancho Agua Dulce, lower slopes of Sierra San Manuel, *Wynd & Mueller* 328; limestone hill near Santo Domingo, *Wynd & Mueller* 452; Santa Anna Canyon, *Marsh* 498; Palm Canyon, near Muzquiz, *Marsh* 322; Flores Pasture, near Muzquiz, *Marsh* 315; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh* 1330; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh* 1437; Sierra del Pino, La Noria, flats, *Johnston & Muller* 452, 695, 696; Sierra Madera, Cañon Charretera, bed of arroyo in oak belt, *Johnston* 9068; south of Laguna Leche, slightly saline and gypseous soil near mogote, *Johnston* 8621.

Ranging from Texas to Arizona and south to southern Mexico. A rather coarse and stiff plant with strict subsessile clusters of spikelets forming a stiff interrupted spike 15–30 cm. long. Differing from *A. Reverchoni*, with which it intergrades, in the stiffer brownish awns, firmer non-purpureous glumes, somewhat interrupted longer spike, and frequently loosely appressed spikelet-clusters. It intergrades with *A. pansa*, *A. arizonica*, *A. Reverchoni*, and *A. Roemeriana*.

To this species I have referred most of the larger plants of Texas and northeastern Mexico which Hitchcock placed in *A. Wrightii* and in *A. glauca*. Hitchcock attempted to distinguish *A. glauca* and *A. Wrightii* by attributing to the former a more slender and elongate, usually somewhat twisted, beak to the lemma, but I find these characters too indefinite and variable to be of any use, if not actually illusionary. Hennard placed great emphasis on the obtuse somewhat dentate tips of the glumes found in the type of *A. curvifolia*, but this character is variable and, furthermore, appears sporadically in various species of northern Mexico and the western United States. Otherwise the species seems nearly the same as the Texan plant described as *A. Wrightii*.

Aristida pansa Woot. & Standl. Contr. U. S. Nat. Herb. **16**: 112 (1913).

COAHUILA: Along trail between southern end of Hillcoat Mesa and Buena Vista headquarters, July 27, 1938, *Marsh* 1493; western base of Picacho del Fuste, gypsum beds on north-facing mountain side, *Johnston* 8399; western base of Picacho del

Fuste, rocky flats, *Johnston* 8419; tableland north of Cañon del Cuervo Chico, base of low limestone hill, *Johnston* 8563; Aguaje Pajarito, west end of Sierra Fragua, rocky flats, *Johnston* 8714; north of La Ventura, on gypsum beds, *Shreve & Tinkham* 9608; Picacho de San José, about ledges on high northwestern slope, *Johnston* 8209.

Western Texas and New Mexico south into our area. A plant with branched inflorescence, the branches short, stiffly ascending, and bearing crowded appressed spikelets in dense spicate clusters. The species intergrades with *A. divaricata*, *A. dissita*, and *A. curvifolia*. Typically it has three subequal awns. Among the collections above cited, however, *Johnston* 8209, 8399, and 8414 are plants otherwise agreeing with *A. pansa* but having only a well-developed middle awn, the lateral ones being reduced and nearly wanting. Another collection, *Johnston* 8419, consists of plants with three subequal awns and was mixed with plants, otherwise similar, having the lateral awns reduced and nearly wanting. The plants with single awns suggest *A. Schiedeana*, but they are obviously variations of *A. pansa*. Curiously they come from the same area in Coahuila where I found a homologous form of *A. adscensionis*.

Aristida dissita sp. nov.

Planta perennis caespitosa 3-7 dm. alta perinconspicue minuteque pubesca et scabridula; culmis numerosis confertis simplicibus teretibus inconspicue striatis; vaginis striatis quam internodiis longioribus, margine ad apicem villosis; ligula subnulla dense breviterque villoso-ciliata; laminis 1-2 dm. longis rigidulis rectis vel saepe plus minusve curvatis glauco-viridibus, saepe involutis et 0.5-1 mm. crassis, raro subplanis et ad 1.5 mm. latis, supra minute hispidulis et scabridulis, subtus sublevibus; panicula exserta elongata 1-3 dm. longa saepe 6-8 cm. crassa aperta dissitiflora adscendente ramosa; rhachi tereti superne subangulata, ramis in nodis solitariis vel binis vel raro trinis gracilibus angulo ca. 45° ab rhachi divergentibus, infra medium paniculae 3-5 cm. distantibus, supra medium 1-3 cm. distantibus; spiculis 0-5 (raro ad 10) mm. longe pedicellatis angulo ca 45° a ramis divergentibus, supra medium ramis 2-8 laxe dispositis; glumis violaceis vel purpureo-viridibus angustis acuminatis, non raro in arista inconspicua gracili terminatis, glabris uninervatis carinatis, gluma exteriore (7-)8-9 mm. longa; gluma interiore (8-)9-10 mm. longa, quam exteriore 1-2 mm. longiore; fructibus angustissimis graciliter attenuatis nigrescentibus non tortis praesertim supra medium non raro minutissime scabridis; aristis subaequalibus 12-18 mm. longis rectis tenuibus; callo ca. 0.9 mm. longo acuto barbato.

COAHUILA: Several miles west of Buena Vista, along road from San Antonio de los Alamos, banks of gypsiferous shales, *Johnston* 8302; 3 mi. east of San José, silty flat, openings in mogote, *Johnston* 8218. CHIHUAHUA: 4 mi. southeast of Mestñas, grassy rocky slope, *Stewart & Johnston* 2016; Chihuahua, 1935, *LeSueur* 19; near Chihuahua, hills and plains, Oct. 13, 1885, *Pringle* 388 (TYPE, Gray Herb.); 13 km. south of Jimenez, *Harvey* 1344. TEXAS: El Paso, mesa, base of hill, 1915, *Hitchcock* 774; Sierra Prieta, Hudspeth Co., 1928, *Cory* 1049; Eagle Mt. mine, Hudspeth Co., 1928, *Cory* 1048; 9 mi. east of Van Horne, Culberson Co., probably gypsiferous soil, *Waterfall* 4161; Nichols Ranch, Glass Mts., Brewster Co., *Warnock* T532. NEW MEXICO: 15 mi. west of Las Lunas, Valencio Co., sandy alluvium, *Bacigalupi* 572.

This species keys to *A. pansa* in Hitchcock's treatment of the genus in the Manual of the Grasses of the United States, 440 (1935), and in North

American Flora, **17**: 376 (1935), and is probably closely related to that species. It agrees with *A. pansa* in having an inflorescence with moderately elongate ascending branches, but it differs in having the spikelets spreading from the branch and hence very loosely disposed, rather than closely appressed to the branch and forming a spicate cluster. The proposed species frequently suggests *A. barbata*, but that plant has a proportionately broader panicle with longer and more widely spreading branches, as well as larger and more widely spreading spikelets on more elongate pedicels. Some of the cited material of *A. dissita* has been identified as *A. hamulosa*, but that species is readily distinguished by its elongate widely spreading or even reflexed panicle-branches and its larger very strict spikelets in spicate clusters. The same characters readily separate it from *A. divaricata*, the species to which the type collection was referred by Hitchcock, Contr. U. S. Nat. Herb. **22**: 549 (1924). In trans-Pecos Texas the panicle-branches of *A. dissita* shorten and become more strict and it passes into *A. Reverchoni*, *A. pansa*, *A. Roemeriana*, and even *A. curvifolia*. The loose inflorescence of *A. dissita*, with its ascending panicle-branches, up to 7 cm. long, and loosely disposed ascending spikelets, gives the species a distinctive aspect and permits its ready recognition. It is difficult to understand why the plant should have remained so long without a name.

Tragus Berteronianus Schult. Mant. **2**: 205 (1824).

COAHUILA: Palm Canyon, near Muzquiz, *Marsh 1000*; Saltillo, 1898, *Palmer 396*; north end of Sierra Cruces, sabaneta west of San Rafael, *Johnston & Muller 1035*. CHIHUAHUA: Presidio del Norte, *Bigelow*; Rancho El Pino, 10 km. southeast of Sierra Rica, *Stewart 2403*; 10 mi. southeast of Organos, under bushes at foot of grassy slope, local, *Stewart & Johnston 2036*; hills and plains near Chihuahua, Aug. 1885, *Pringle 421*; Meoqui, 1935, *LeSueur 33*. ZACATECAS: Near Concepcion del Oro, many plants together among bushes and rocks on stony mesas, 1904, *Palmer 279*.

Texas to Arizona and south to South America and in the warmer parts of the Old World. Although stated by some authors to be introduced into our area, it behaves like an indigenous species. It associates with indubitably native species in scattered localities far from human habitations, and it was collected in Texas, New Mexico, and Arizona far from settlements by the early botanists exploring that then frontier area a hundred years ago. Hitchcock, Contr. U. S. Nat. Herb. **17**: 216 (1913), reports collections of the species from Tlahualilo, Durango, and from Sabinas and Soledad, Coahuila.

Hilaria mutica (Buckl.) Benth. Jour. Linn. Soc. Bot. **19**: 62 (1881).

VERNACULAR NAME: Tobosa.

COAHUILA: Sierra del Carmen, Sept. 6, 1936, *Marsh 853*; Rancho Agua Dulce, eastern slope of Sierra San Manuel, *Wynd & Mueller 481*; Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1434*; El Berrendo, *Harvey 1175*; near La Rosa, *Shreve & Tinkham 9905*; between Hac. La Rosa and Hac. Lechuguilla, dry desert, *Wynd & Mueller 61*; 6 mi. north of Castillon, dominant on large flat, *Johnston & Muller 191*; northeastern foothills of Sierra Cruces, 5 mi. south of San Rafael, silty flat in arroyo, *Johnston & Muller 1031*; 7 mi. south of Jaco, small flat among mesquites, *Johnston & Muller 1115*. CHIHUAHUA: Chihuahua, plains, *Pringle 485*; Meoqui, 1935, *LeSueur 40*; 10 km. east of Jimenez, *Harvey 1348*; 5 mi. east of Carrillo, extensive clumps on lower slopes of dunes, *Muller 3321*. DURANGO: 3 mi. northeast

of Bermejillo, flats among mesquites, *Johnston* 7788; Torreon, 3–4 ft. tall, protection of mesquites, 1898, *Palmer* 506.

Ranging from western Oklahoma and central Texas west to Arizona and south into our area. A common and widespread grass characteristic of flats where water collects after storms and stands for some time before evaporating. The tobosa flats are most common on the clay soils of the calcareous areas, where they vary from a few square meters in extent up to considerable size. In the igneous areas in eastern Chihuahua, tobosa flats are found chiefly on the bottoms of the larger basins. In Coahuila, in calcareous clays, tobosa flats may be encountered in varying abundance from the bottom of the broad valleys up the long slopes to the bases of the mountains and even on flat places in open canyons in the foothills. The soils of tobosa flats may be moderately gypsiferous, but they seldom if ever are saline. Tobosa growing in favorable situations with continually renewed soil-moisture is considered a good feed for stock. The tobosa developing on flats where it is subjected to irregular wettings and long periods of drought is said to become excessively siliceous and rapidly wears down the teeth of stock subsisting on it. Because of this fact, stock-men distinguish the ecological forms of tobosa and have various names for them. As a botanist I have even been severely criticized for insisting they were all one species.

Hilaria Belangeri (Steud.) Nash, No. Am. Fl. 17: 135 (1912).

COAHUILA: Base of the mountains 3 mi. southeast of Saltillo, *Johnston* 7251. CHIHUAHUA: Chihuahua, *LeSueur* 18; Chihuahua, hills and plains, *Pringle* 493; Parral-Chihuahua road, 19 mi. north of Rio San Pedro, *Harvey* 1432.

Texas to Arizona and south into northern Mexico. The present northern plant is very closely related to *H. cenchroides* H.B.K., of central Mexico, and is perhaps not specifically distinct.

Aegopogon cenchroides H. & B. ex Willd. Sp. Pl. 4: 899 (1806).

CHIHUAHUA: Mapula Mts., thin soil on ledges, Oct. 25, 1886, *Pringle* 823.

Ranging along the western Sierra Madre, from northwestern Chihuahua and adjacent Sonora south to South America.

Microchloa Kunthii Desv. Opusc. 75 (1831).

CHIHUAHUA: Pirámide, sheltered places about the bases of large rock masses, *Johnston* 8120; dry gravelly soil on mesa west of Chihuahua, Aug. 6, 1885, *Pringle* 425.

Baja California and northern Chihuahua south to Argentina.

Leptochloa dubia (H.B.K.) Nees, Syll. Pl. Ratisb. 1: 4 (1824).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh* 723; Jardin del Sur, Sept. 3, 1936, *Marsh* 767; Hillcoat Mesa, west of Encantada Ranch, July 24, 1938, *Marsh* 1449; Sierra Guajes, Cañon Madera, hillsides, *Stewart* 1506; Sierra Madera, Cañon Charretera, ledges among bushes on sunny hillside in oak belt, *Johnston* 9103; Saltillo, sandy bottomland, *Hitchcock* 677; Saltillo, 1898, *Palmer* 381, 382; 2 mi. west of Saltillo, *Harvey* 1092A; Sierra del Pino, La Noria, arroyo banks in oak belt, *Johnston & Muller* 493, *Stewart* 1201; Sierra Cruces, 8 mi. north of Santa Elena, thickets along arroyo, *Johnston & Muller* 1029; Sierra Negras, 9 km. south of Parras, *Stanford et al.* 189. CHIHUAHUA: Ojo Almagre, Sierra Almagre, wet sand, *Johnston & Muller* 1212; hills and plains near Chihuahua, *Pringle* 422. ZACATECAS: Concepcion del Oro, 1904, *Palmer* 268.

Texas and Oklahoma to Arizona and southward through Mexico; Argentina. Hitchcock, Contr. U. S. Nat. Herb. **17**: 350 (1913), reports the species from Cedros and Pico de Tiera, Zacatecas. A perennial species usually growing among brush on rocky hillsides and flats.

Leptochloa filiformis (Lam.) Beauv. Ess. Agrost. 71, 166 (1812).

COAHUILA: Monclova, 1880, Palmer 1364; Monclova, 1939, Marsh 1843.

A weedy plant, widely distributed in the warmer parts of America. Hitchcock, Contr. U. S. Nat. Herb. **17**: 349 (1913), reports a collection by Pringle (no. 1161) from "Paso del Norte," Chihuahua.

Leptochloa viscida (Scribn.) Beal, Grasses No. Am. **2**: 434 (1896).

CHIHUAHUA: Plains near Chihuahua, wet places, 1886, Pringle 814.

Wet places, Texas to California and northern Mexico.

Leptochloa fascicularis (Lam.) Gray, Man. 588 (1848).

COAHUILA: Road to Don Martin Dam, Harvey 947. CHIHUAHUA: Plains near Chihuahua, shallow water, 1886, Pringle 813; Camargo, along the Rio Conchos, Harvey 1403. DURANGO: Torreon, in soft mud in overflowed land, 1898, Palmer 503.

Wet, frequently brackish soils. Widely distributed in the warmer parts of America.

Leptochloa uninervia (Presl) Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 383 (1917).

Collected on the Texas bank of the river (Boquillas, Mariscal Canyon, and mouth of Tornillo Creek) in the Big Bend of the Rio Grande and presumably on the Coahuilan bank of the river also. Widely distributed in wet places in the warmer parts of America.

Eleusine indica (L.) Gaertn. Fruct. et Sem. **1**: 8 (1788).

COAHUILA: Monclova, 1939, Marsh 1840. CHIHUAHUA: Presa de Chihuahua, 1936, LeSueur 129.

Widely distributed weedy plant, introduced from the Old World.

Cynodon Dactylon (L.) Pers. Syn. **1**: 85 (1805).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, Marsh 740; Yerda Spring, Marsh 265; Hermanas, Marsh 1611; Monclova, Marsh 1697, Harvey 1131; Saltillo, 1898, Palmer 254; Parras, Nov. 1910, Purpus 5087; 11 km. northeast of Jimulco, Stanford et al. 3. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, sandy arroyo, Stewart 2404; 5 km. west of Camargo, Harvey 1410. DURANGO: Torreon, low places, 1898, Palmer 814.

Introduced from the Old World, now widely distributed in the warmer parts of America. A common plant in moist soils, along river bottoms, about fenced tanques, along irrigation ditches, and frequently a tenacious weed in cultivated soils.

Spartina Spartinae (Trin.) Merrill ex Hitchc. Contr. U. S. Nat. Herb. **17**: 329 (1913).

COAHUILA: Cuatro Cienegas, 1939, Marsh 2037, 2039; Viesca, 1938, Shreve 8772.

Wet saline soils from Florida to Texas and south to Central America; Argentina. In eastern Mexico it has been collected inland in Coahuila and about Hacienda Angostura, east of San Luis Potosi.

Chloris virgata Sw. Fl. Ind. Occ. 203 (1797).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh* 749; 20 mi. northwest of La Babia, open valley floor, *Wynd & Mueller* 443; Santa Anna Canyon, *Marsh* 429; Monclova, *Marsh* 1848; west of Puerto de las Monjas, 1-4 ft. tall, low ground, *Johnston* 8640; Parras, along arroyo in thickets, 1898, *Palmer* 448; Parras, 1880, *Palmer*; 7 mi. south of Jaco, about mogote, *Johnston & Muller* 1105; meadow about charco southeast of Almagre, *Johnston & Muller* 1226. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, *Stewart* 2397; Los Medanos, 1935, *LeSueur* 63; Meoqui, 1935, *LeSueur* 31; Jimenez, banks of the Rio Florida, *Harvey* 1318.

Texas to southern California, and south to Argentina. Hitchcock, Contr. U. S. Nat. Herb. 17: 332-333 (1913), reports specimens from Chihuahua City, Torreon, Tlahualilo, and Saltillo. This annual grass is most commonly found in and about mogotes, growing through low bushes on bajillos, in fenced areas about tanques, or in other areas where silty soil is frequently well moistened. In well watered situations it may grow over a meter high. In some unfavored places depauperate plants less than a decimeter high may be found.

Chloris submutica H.B.K. Nov. Gen. et Sp. 1: 167 (1816).

COAHUILA: Saltillo, along ditch at edge of corn field, 1898, *Palmer* 390. CHIHUAHUA: Northeast of Chihuahua, valley near Nombre de Dios, Aug. 20, 1885, *Pringle* 424. ZACATECAS: 15 km. west of Concepcion del Oro, valley floor, *Stanford et al.* 558.

From our area south to central Mexico.

Chloris latisquamea Nash, Bull. Torr. Bot. Cl. 25: 439 (1898).

COAHUILA: 11 mi. south of Allende, along tree-lined arroyo, *Johnston* 7018; Sabinas River, Muzquiz, *Marsh* 399.

Texas and northeastern Coahuila.

Chloris aristata (Cav.) Swallen, No. Am. Fl. 17: 596 (1939).

COAHUILA: Parras, among weeds on bank of ditch, 1898, *Palmer* 450.

From our area south to Costa Rica.

Chloris andropogonoides Fourn. Pl. Mex. 2: 143 (1886).

COAHUILA: Palm Canyon, near Muzquiz, *Marsh* 984.

Texas and northeastern Mexico.

Trichloris mendocina (Phil.) Kurtz, Mem. Fac. Cien. Univ. Córdoba 1896: 37 (1897).

COAHUILA: Perros Bravos, Sept. 20, 1848, *Gregg* 473; near Horizonte, 1937, *Wynd* 774; valley of the Nazas, May 10, 1847, *Gregg* 611. CHIHUAHUA: Near El Carmen, 1935, *LeSueur* 70; valley near Chihuahua, 1885, *Pringle* 475. DURANGO: Torreon, along dry ditch among shrubs and cacti, *Hitchcock* 658.

Arizona to trans-Pecos Texas, along the Rio Grande Valley to Laredo, and south into our area; southern South America.

Trichloris pluriflora Fourn. Mex. Pl. 2: 142 (1886).

Hitchcock, Contr. U. S. Nat. Herb. 17: 335 (1913), reports a collection (*Nelson* 6827) from Sabinas, Coahuila. Southern Texas, west to Val Verde County, and south in eastern Mexico; also in Andean South America.

Bouteloua simplex Lag. Var. Cien. 4: 141 (1805).

COAHUILA: Saltillo, corn field, 1898, *Palmer* 397, 398; Chojo Grande, 27 mi. south-

east of Saltillo, appearing after rains in level places near water-course, 1904, *Palmer* 332.
Western Texas and Colorado to Arizona, south to central Mexico.

Bouteloua Parryi (Fourn.) Griffiths, Contr. U. S. Nat. Herb. **14**: 381 (1912).
Bouteloua polystachya var. *vestita* Wats. Proc. Am. Acad. **18**: 177 (1883).

COAHUILA: Carneros Pass area, 1880, *Palmer* 1357 (type of var. *vestita*). CHIHUAHUA: Pirámide, gravelly plain near rock masses, *Johnston* 8132; center of large grassy plain 7 mi. northeast of La Morita, common, *Johnston* 7971; base of Sierra Santa Eulalia, sandy alluvium of streams in rocky hills, *Pringle* 413.

New Mexico to Arizona and south to San Luis Potosi.

Bouteloua barbata Lag. Var. Cien. **4**: 141 (1805).

VERNACULAR NAME: Pata del Cuervo.

COAHUILA: Sacramento, gravelly arroyo, *Johnston* 7086; Cuatro Cienegas, *Marsh* 2065; 4 mi. east of Cuatro Cienegas, ditch by road, *Johnston* 7117; near Rosario, about edge of mogote, stems spreading, *Johnston* 8824; 20 km. north of junction of Monclova and Torreon roads, *Harvey* 1109; 42 mi. east of Saltillo, *Shreve & Tinkham* 9837; Saltillo, near ditch, prostrate, 1898, *Palmer* 400, 401; south base of Picacho San José, gravelly flat, erect, *Johnston & Muller* 804; 3 mi. east of San José, silty plain, ascending, *Johnston* 8216; 7 mi. south of Jaco, about mogote, decumbent, *Johnston & Muller* 1106; Torreon, bank of Rio Nazas in railroad cut, 1898, *Palmer* 514; plains near Jimulco, 1902-1905, *Pringle* 11216, 13626. CHIHUAHUA: Presidio del Norte, *Bigelow*, *Parry*; 5½ mi. south of Ojinaga, outwash from saline shales, *Johnston* 8006; 4½ mi. northwest of San Francisco, grassy flat, ascending, *Stewart & Johnston* 2010; Los Medanos, *LeSueur* 59; Villa Ahumada, flats, *LeSueur* 65; Chihuahua, hills and plains, *Pringle* 490.

Texas to southern California and south to southern Mexico. This small rapidly growing annual grass is widely distributed in our area, especially about mogotes, ditches, and similar sites where run-off collects after storms and the soil is moistened at frequent intervals during the summer.

Bouteloua hirsuta Lag. Var. Cien. **4**: 141 (1805).

VERNACULAR NAMES: Grama; Navajitas.

COAHUILA: Sierra del Carmen, Aug. 14, 1936 and Sept. 1, 1936, *Marsh* 657, 887; trail from Encantada Mesa to Fresno Mesa, July 14, 1938, *Marsh* 1397; 3 mi. southeast of Saltillo, common on slopes at base of mountains, *Johnston* 7249; Sierra del Pino, La Noria, common on gravelly flats, *Johnston & Muller* 451, *Stewart* 1204; west base of Picacho del Fuste, rocky flats, *Johnston* 8425; Sierra Madera, Cañon Charretera, openings in brush on rocky flats, *Johnston* 9058; eastern foothills of Sierra Cruces near Santa Elena, rocky flats and slopes, *Johnston & Muller* 217, 1385, *Stewart* 831. CHIHUAHUA: Sierra Virulento, east of Rancho Virulento, rocky terrace, *Johnston* 9084; Sierra Organos, 1937, *LeSueur* 165; hills and plains near Chihuahua, *Pringle* 409.

Widely distributed in the western United States and south to Guatemala. Well-drained soils on plains and hillsides. Usually growing with the more common *B. gracilis*.

Bouteloua scorpioides Lag. Gen. et Sp. Nov. 5 (1816).

Reported by Griffiths and Hitchcock from Cedros, Zacatecas (*Lloyd* 105), where it is said to make turf on the plains. Otherwise the species is known only from central Mexico, from San Luis Potosi to Puebla.

Bouteloua ramosa Scribn. ex Vasey, U. S. Dept. Agric., Div. Bot. Bull. **121**: t. 44 (1890).

VERNACULAR NAMES: Chino; Zácate Chino.

COAHUILA: 20 km. south of Ocampo, gravelly flats at base of mountains, *Johnston*

9177; Monclova, 1880, *Palmer* 1358; Cuatro Cienegas, Puerto del Norte, *Harvey* 1207; Cuatro Cienegas, *Marsh* 2054; near Rancho Santa Teresa, south of Castaños, *Wynd & Mueller* 172; 25 mi. south of Monclova, limy hillside, *Johnston* 7200; hills 20 mi. west of Saltillo, *Shreve & Tinkham* 9826; Saltillo, rough stony mountain-side, 1898, *Palmer* 404; west base of Picacho del Fuste, rocky flats, *Johnston* 8418; west end of Sierra Fragua, near Aguaje Pajarito, rocky flat, *Johnston* 8793; desert 55 mi. west of Saltillo, rocky sandstone slope, *Johnston* 7697; Picachos Colorados, rocky slope at base of cliffs, *Johnston & Muller* 117; Sierra Cruces near Santa Elena, rocky flats among brush, *Johnston & Muller* 1022, 1383; San Antonio de los Alamos, gravelly flat at head of cliffs, *Johnston* 8249; near Bufido, limestone hillside, *Johnston & Muller* 850. CHIHUAHUA: Sierra Santa Eulalia, dry calcareous banks, Aug. 14, 1885, *Pringle* 414; 13 mi. south of Jimenez, *Harvey* 1339; 31 mi. southeast of Jimenez, *Muller* 3329. ZACATECAS: Mountains back of Apizalaya, Hac. Cedros, *Lloyd* 254 (US).

Southern trans-Pecos Texas south into our area. A common and characteristic grass on stony slopes and flats along the base and in the foothills of the limestone mountains of Coahuila, particularly in the Palma Belt, where it is usually abundant and a major forage grass.

In recent treatments of *Bouteloua*, the present species, *B. ramosa*, has been treated as a synonym of *B. breviseta* Vasey. These two species, however, although obviously closely related, differ in distribution, soil preference, habit of growth, and in some minor morphological characters. *Bouteloua breviseta* is a plant of highly gypsiferous soils in the northern half of trans-Pecos Texas and in southeastern New Mexico. Its leaves are strongly involute and its spikes are pale and erect or stiffly ascending. *Bouteloua ramosa*, ranging south of *B. breviseta*, is a plant of stony, prevailingly limestone, flats and slopes. Its leaf-blades are usually nearly flat, with the upper surface much less hairy than in *B. breviseta*. The dark-colored spikes are stouter and much more spreading. The stems become more fruticulose, are strictly erect, and form denser tufts.

***Bouteloua gracilis* (H.B.K.) Lag. ex Steud. Nom. Bot. ed. 2, 1: 219 (1840).**

VERNACULAR NAMES: Grama; Navajitas.

COAHUILA: Sierra del Carmen, Aug. 21 and 29, 1936, *Marsh* 570, 693; 20 mi. northwest of Hac. La Babia, open valley floor, *Wynd & Mueller* 435; trail from southern end of Hillcoat Mesa to Buena Vista headquarters, July 27, 1938, *Marsh* 1506; Mesa Grande, 40 km. northwest of Hac. Encantada, meadows, abundant, *Stewart* 1632; Saltillo, stony mountain-side, 1898, *Palmer* 399, 406; Saltillo, along ditches, 1898, *Palmer* 403; 3 km. southwest of Fraile, *Stanford et al.* 332; San Antonio de las Alanzanas, frequent, Aug. 3, 1848, *Gregg* 370; Sierra del Pino, La Noria, meadows, *Johnston & Muller* 701, *Stewart* 1209; west base of Picacho del Fuste, gravelly soil, 2-3½ ft. tall, *Johnston* 8424; Sierra Madera, Cañon Charretera, open rocky canyon floor, 2-3 ft. tall, *Johnston* 9159; tableland north of Cañon del Cuervo Chico, rocky slopes of low limestone hills, *Johnston* 8560; between Palos Blancos and San Pedro, east of Cuesta Zozaya, high grassy valley, *Johnston* 9274; Sierra Cruces, near Santa Elena, stony flats among bushes, *Johnston & Muller* 1028; gypsum ridge east of Laguna Jaco, common, *Stewart & Johnston* 1964, 1966. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, rocky slopes, *Stewart* 2408; Sierra Virulento, rocky terrace, *Johnston* 9082; 2 mi. west of Pozo de Villa, sabaneta under low bushes, *Johnston* 8165; 4½ mi. northwest of San Francisco, grassy flat, *Stewart & Johnston* 2011; Sierra Organos, 1937, *LeSueur* 166; White Water, 1893, *Mearns* 2301; Villa Ahumada, flats, *LeSueur* 66; near Chihuahua, *Pringle* 407; 6 mi. west of Piloncillo, with tobosa in grassland, *Johnston* 7878. ZACATECAS: Valley 15 km. west of Concepcion del Oro, *Stanford et al.* 522; Pico de Teira, *Lloyd* 242 (US).

Widely distributed in the western United States and south to central Mexico. A generally distributed grass in our area. It is abundant in some of the larger valleys and on the igneous oak-clad hills of eastern Chihuahua, where it may become the dominant plant over large areas. In the limestone areas of Coahuila it is rather common on the tablelands and larger valleys in the oak and lower pine belts. On the lower slopes of the limestone mountains it is frequent with other grasses among the bushes on rocky flats and slopes in the Palma Belt. It avoids clay, and along the foot of limestone mountains it is found only where the soil is stony.

Bouteloua eriopoda Torr. Pac. R. R. Rep. 4: 155 (1857).

COAHUILA: Sierra del Carmen, Sept. 13, 1936, *Marsh* 896; west base of Picacho del Fuste, cemented gravels on flats, not common, stems pallid, sprawling, *Johnston* 8420; San Antonio de los Alamos, summit of high tuff cliffs, gravelly flat, *Johnston* 8251, 8257; west end of Sierra Fragua, Aguaje Pajarito, frequent on rocky flats, stems grayish, erect or ascending, *Johnston* 8718; eastern foothills of Sierra Cruces near Santa Elena, gypsum flat, *Johnston & Muller* 245; Sierra Cruces, 8 mi. north of Santa Elena, stony flat among bushes, stems laxly ascending, *Johnston & Muller* 1021, 1025; south base of Picacho San José, rocky slope, stems wiry, ascending, *Johnston & Muller* 802. CHIHUAHUA: 1 mi. east of Pozo de Villa, silty plain, among bushes, *Johnston* 8176; Presidio del Norte, Sept. 1, 1852, *Bigelow*; east base of Sierra Virulento, rocky bench, *Johnston* 8085; 4½ mi. northwest of San Francisco, fairly abundant on grassy flat, *Stewart & Johnston* 2012; Sierra Organos, 1937, *LeSueur* 162; Sierra Santa Eulalia, Aug. 31, 1885, *Pringle* 411; south of San Fernando, silty soil on plain, common, *Johnston* 7937; 6 mi. west of Piloncillo, lava slope, *Johnston* 7875.

Western Texas to Arizona and northern Mexico. A generally distributed but not abundant grass in northern Coahuila and eastern Chihuahua. Its pallid lax loosely ascending frequently somewhat sprawling stems and woolly leaf-sheaths give the plant a very distinctive appearance.

Bouteloua Karwinskii (Fourn.) Griffiths, Contr. U. S. Nat. Herb. 14: 394 (1912).

COAHUILA: Valley floor 3–4 km. east of Puerto Caballo, with tobosa, common, *Johnston* 8319; south of Laguna de Leche, flats formed by planed-off Upper Cretaceous beds, slightly saline and gypsiferous soil, *Johnston* 8618; 1–2 mi. west of Matrimonio Viejo, about mogote at base of slightly saline and gypsiferous slope, *Johnston* 9370. ZACATECAS: Cedros, *Lloyd* 170, 183 (US); 7 mi. north of San Tiburcio, heavy slightly saline soil on flats with mesquites, abundant, *Johnston* 7358.

Ranging from our area south and east to southern Tamaulipas (Cañon de las Minas et Victoria, *Karwinski* 1479, type) and San Luis Potosí. Griffiths, l.c., collected the species at Alonzo, east of San Luis Potosí, and gives an illustration, pl. 76, of the habitat. The species appears to be confined to slightly saline and gypsiferous clays. In habit it suggests small slender plants of *B. gracilis*, but it has smaller pale spikes.

Bouteloua trifida Thurb. in Wats. Proc. Am. Acad. 18: 177 (1883).

COAHUILA: Road to Don Martin Dam, 9 km. from Nuevo Leon border, *Harvey* 925; Allende, *Marsh* 1788; Palm Canyon, near Muzquiz, *Marsh* 977; Yerda Spring, *Marsh* 290; Santa Anna Canyon, *Marsh* 467; Zacate, *Marsh* 503; Hermanas, *Marsh* 1620; 2 mi. northwest of Fronteras, road to Natadores, silty desert plain, *Johnston* 7171; Monclova, 1880, *Palmer* 1355 (TYPE); Cañon Bocatoche, dominant grass of drier valley-floor, clumps 3 in. in diameter, *Muller* 3110; on desert near Rancho Santa Teresita, south of Castaños, *Wynd & Mueller* 205; dry desert between Hac. La Rosa and Hac. Lechuguilla, *Wynd & Mueller* 65; Saltillo, summit of stony treeless mountain, 1898, *Palmer* 402; Saltillo, 1905, *Palmer* 522; base of mountains 20 km. south of

Ocampo, one plant in mogote, *Johnston* 9170; south of Laguna de Leche, slightly saline and gypseous silty flat, *Johnston* 8619; Sierra Cruces, north of Santa Elena, rocky flat among bushes, *Johnston & Muller* 1020, 1379. CHIHUAHUA: Base of Sierra Santa Eulalia, dry gravelly soil, *Pringle* 412.

Western Texas to southern Nevada and Arizona, south to San Luis Potosi.

Bouteloua aristidoides (H.B.K.) Griseb. Fl. Brit. W. Ind. 537 (1864).

COAHUILA: Soledad, 1880, *Palmer* 1354; Monclova, 1880, *Palmer* 1353; Torreon, abundant in deep cut along railroad, 1898, *Palmer* 513. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, rocky slope, *Stewart* 2393; Pirámide, gravelly flats under large oaks, *Johnston* 8117; low ridge southwest of Mestefas, rocky slope, ascending, *Stewart & Johnston* 2022; Sierra Organos, 1937, *LeSueur* 39; 11 mi. northeast of Camargo, gravelly benches, common, *Johnston* 7904; Jimenez, banks of Rio Florida, *Harvey* 1323; Cañon La Renga, 15 km. northwest of Santa Fe, dry arroyos, ascending, *Stewart* 2620.

Western Texas to southern California and south to central Mexico; South America.

Bouteloua chondrosioides (H.B.K.) Benth. ex Wats. Proc. Am. Acad. **18**: 179 (1883).

CHIHUAHUA: Volcanic hills 20 km. north of Chihuahua, locally common along base of rocky slope, *Stewart & Johnston* 2129; rocky hills northeast of Chihuahua, forming close sod on small patches, *Pringle* 410.

Trans-Pecos Texas to Arizona and south to southern Mexico. Apparently favoring igneous rocks.

Bouteloua rigidiseta (Steud.) Hitchc. Jour. Wash. Acad. **23**: 453 (1933).

COAHUILA: Calcareous mesa near Piedras Negras, April 20, 1900, *Pringle* 8018.

Oklahoma south through central and eastern Texas into adjacent Mexico.

Bouteloua radicosa (Fourn.) Griffiths, Contr. U. S. Nat. Herb. **14**: 411 (1912).

COAHUILA: Don Martin Dam, *Harvey* 934; Caracol Mts., 1880, *Palmer* 1354; Puerto San Lazaro, common on rocky arroyo banks, *Muller* 3051.

Coahuila to Arizona and south to southern Mexico.

Bouteloua Johnstoni Swallen, Proc. Biol. Soc. Wash. **56**: 79 (1943).

COAHUILA: South end of Cañada Oscuro, confined to gypsum beds on the escarpment near Tanque La Luz, locally very common, *Johnston* 8491 (ISOTYPE); high west end of the Sierra Fragua, north of Puerto Colorado, one large colony on east slope just below high crest, *Johnston* 8751; 1 km. northeast of Parritas, east side of Valle Acatita, common on gypsum mesas, *Stewart* 2763.

A very distinct species, of which only the three collections cited above are known. Near Tanque La Luz in Cañada Oscuro, and a mile or so to the southeast, on the steep north-facing slopes at the mouth of Cañon del Cuervo Chico, the grass was common on all the gypsum beds exposed on the escarpment. Its behavior was that of a marked gypsophile. On the steep west-facing slope up which I climbed from near Aguaje Pajarito to the high western crest of the Sierra Fragua, I found the grass again common. Here it was confined to a sharply delimited belt over a hundred feet wide. It was associated with some gypsum indicators, but the soil on which it grew was not pure gypsum, only very moderately gypseous at most. My collection no. 8751 came from a small colony near the ridge crest, and the only

one observed away from the belt of the plant just mentioned. The soil gave no indications of being gypsiferous and no recognized gypsophiles were growing with it. Mr. Stewart's collection from near Rancho Parritas came from gypsum.

The plant has a very distinctive habit of growth. The stems, 15–45 cm. long, are ascending or decumbent. The clump appears to die in the middle and soon forms loose spongy rings of growth 5–10 dm. in diameter.

Bouteloua curtipendula (Michx.) Torr. in Emory, Notes Mil. Recon. 154 (1848).

COAHUILA: Desert 25 mi. southwest of Sabinas, *Wynd & Mueller* 217; Sierra del Carmen, Aug. 12, 1936, *Marsh* 642; Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller* 642; Yerda Spring, *Marsh* 252, 264; Palm Canyon, *Marsh* 980; Santa Anna Canyon, *Marsh* 546; trail from south end of Hillcoat Mesa to Buena Vista headquarters, July 27, 1938, *Marsh* 1507; Monclova, *Harvey* 1151; Sierra Gloria, *Marsh* 1946; La Rosita, *Shreve & Tinkham* 9592; Saltillo, 1898, *Palmer* 407; Buena Vista, frequent, July 24, 1848, *Gregg* 301; Chojo Grande, 27 mi. southeast of Saltillo, 1904, *Palmer* 371; 3 km. southwest of Fraile, *Stanford et al.* 327; Sierra Cruces, near Santa Elena, abundant on open hillsides, up to 10 dm. tall, *Stewart* 832; San Antonio de los Alamos, gravelly flat on top of cliffs, *Johnston* 8254; west end of Sierra Fragua near Aguaje Pajarito, rocky flats, *Johnston* 8792; Sierra Negras, 9 km. south of Parras, *Stanford et al.* 195; 11 km. northeast of Jimulco, *Stanford et al.* 51. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, rocky slopes, *Stewart* 2406; Chihuahua, rocky hillsides, 1908, *Palmer* 114; Chihuahua, hills and plains near Chihuahua, Aug. 27, 1885, *Pringle* 408. ZACATECAS: Concepcion del Oro, 1904, *Palmer* 264; Cedros, foot-slopes, 1908, *Lloyd* 201.

Widely distributed in central and eastern United States and south to Central America; South America. A common and widely distributed grass in our area, frequent in the grasslands of eastern Chihuahua. In the limestone mountains of Coahuila, with *B. ramosa*, forming the best pasturage for horses and cattle on the rocky slopes and flats in the foothills, and with *B. gracilis* the good pasturage on the tablelands and mountain valleys. In the eastern parts of our area the plants tend to have few spikelets in each spike and to intergrade with *B. uniflora*.

Bouteloua uniflora Vasey, Bot. Gaz. 16: 26 (1891).

COAHUILA: Trail from Encantada Mesa to Fresno Mesa, July 20, 1938, *Marsh* 1376; Sierra del Pino, La Noria, meadow at lower edge of pine belt, *Johnston & Muller* 450, *Stewart* 1217; Sierra Madera, Cañon Charretera, openings in oak thickets on rocky flat, *Johnston* 9060; Saltillo, 1906, *Griffiths* 8408; Carneros Pass, tufts among bushes, *Johnston* 7299. ZACATECAS: Valley 15 km. west of Concepcion del Oro, plant 18 inches tall, *Stanford et al.* 536.

Known from Crockett and Val Verde Counties, Texas, south through eastern Coahuila to southwestern Nuevo Leon. This species is very closely related to *B. curtipendula* and is perhaps no more than an extreme form of that species. The material cited above agrees closely with the type collection. In all the specimens, only a single spikelet is borne at the base of the spike-rachis, which is prolonged above and distinctly overtops the lower glume of the spikelet. Material of *B. curtipendula* from eastern Coahuila and Nuevo Leon frequently has reduced spikes and some specimens have occasional spikes bearing only a single spikelet. In these spikes the rachis is slightly shorter than or about equal to the first glume, and it does not distinctly surpass it, as in typical *B. uniflora*. Since the eastern

material of *B. curtipendula* tends to have the dark-colored spikelets usually present in *B. uniflora* and to simulate that species in habit, the differences seem more technical than important.

Cathestecum erectum Vasey & Hack. Bull. Torr. Bot. Cl. 11: 37. t. 45 (1884).

CHIHUAHUA: Presidio del Norte, *Bigelow, Parry*; 10 mi. south of Ojinaga, one colony in ravine in low hills, *Johnston 8018*.

In Texas known from the Big Bend area, near Presidio, and near Porvenir. The plant in Texas and adjoining Mexico seems confined to areas of gypseous, frequently saline, Upper Cretaceous clays and shales. The type came from Presidio, Texas. The species is also reported from the Pacific slope of Mexico, from Sonora to El Salvador, cf. Swallen, Jour. Wash. Acad. 27: 500 (1937).

Munroa squarrosa (Nutt.) Torr. Pac. R. R. Rep. 4: 158 (1857).

CHIHUAHUA: Sandy soil near Juarez, Sept. 26, 1902, *Pringle*; near Colonia Diaz, *Nelson 6457*.

Central United States south into Chihuahua.

Buchloë dactyloides (Nutt.) Engelm. Trans. Acad. Sci. St. Louis 1: 432 (1859).

COAHUILA: Saltillo, banks of ravine in compact mat, 1898, *Palmer 7*; 2 mi. west of Saltillo on road to Torreon, *Harvey 1087*; valley near Fraile, *Stanford et al. 271, 288*.

CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, wet sandy arroyo, common, *Stewart 2405*; 10 km. east of Jimenez, *Harvey 1346*. ZACATECAS: Concepcion del Oro, cemetery, 1904, *Palmer 267*; valley 15 km. west of Concepcion del Oro, *Stanford et al. 552*; Cedros, sinks and flats, *Lloyd 211*.

Central United States and south in eastern Mexico to Puebla.

Phalaris canariensis L. Sp. Pl. 54 (1753).

COAHUILA: Monclova, 1939, *Marsh 1693*.

A Mediterranean species, introduced in various parts of America.

Phalaris caroliniana Walt. Fl. Carol. 74 (1788).

COAHUILA: Muzquiz, 1936, *Marsh 1078*. CHIHUAHUA: Common, forming large pure stands in low meadows and along ditches, 1908, *Palmer 32*.

Widely distributed in the southern half of the United States and in adjoining Mexico.

Trichachne insularis (L.) Nees, Agrost. Bras. 86 (1829).

COAHUILA: Santa Anna Canyon, *Marsh 430*; hills 20 mi. west of Saltillo, *Shreve & Tinkham 9829*. CHIHUAHUA: Rocky hills near Chihuahua, Aug. 1885, *Pringle 378*.

Florida to New Mexico and south to Argentina. A coarse plant in the tropics but becoming small in stature in our area and frequently rather similar in aspect to *T. californica*, but readily distinguished from it by its proportionately narrower, lanceolate spikelets, bearing sordid or tawny, rather than pure white or purplish, hairs.

Trichachne Hitchcockii Chase, Jour. Wash. Acad. 23: 454 (1933).

COAHUILA: Sierra Cruces, limestone hillside just west of Santa Elena, rare, *Johnston 8195*.

Known from a few collections from Texas (San Antonio west to Sander-son) and south to San Luis Potosi.

Trichachne californica (Benth.) Chase, Jour. Wash. Acad. **23**: 455 (1933).

COAHUILA: Don Martin Dam, Harvey 935; Hermanas, Marsh 1626; Monclova, 1880, Palmer 1341; mouth of Cañon Cuervo Chico, under bushes on rocky flat, Johnston 8570; Rosario, among bushes in mogote, Johnston 8825; 14 mi. east of Paila, Shreve & Tinkham 9899; north of Sierra Cruces, about mogote west of San Rafael, Johnston & Muller 1040. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, rocky slope, Stewart 2409; Coahuilan boundary 1 mi. east of Poza de Villa, among bushes on silty plain, Johnston 8173; Chihuahua, 1935, LeSueur 77.

Texas to Colorado and Arizona, and south to central Mexico.

Digitaria sanguinalis (L.) Scop. Fl. Carn. ed. 2, **1**: 52 (1772).

COAHUILA: Muzquiz-La Mariposa, 1936, Marsh 1049; Monclova, 1939, Harvey 1165; Saltillo, 1898, Palmer 387. CHIHUAHUA: Presa de Chihuahua, 1936, LeSueur 142; 5 km. west of Camargo, 1939, Harvey 1415.

Widely introduced European garden weed.

Leptoloma cognatum (Schult.) Chase, Proc. Biol. Soc. Wash. **19**: 192 (1906).

COAHUILA: Sabinas, Nelson 6822 (US); Santo Domingo, open slopes of igneous hill, Wynd & Mueller 482; Sierra Cruces, edge of gypsum bed in arroyo south of Santa Elena, only one plant seen, Johnston 9405. CHIHUAHUA: 4 mi. southeast of Organos, in low bushes on grassy slope, fairly common, Stewart & Johnston 2047; Chihuahua, hills and plains, Pringle 489 (US).

Eastern United States to Minnesota and Texas and west along the boundary to Arizona; south through eastern Mexico to San Luis Potosi.

Eriochloa gracilis (Fourn.) Hitchc. Jour. Wash. Acad. **23**: 455 (1933).

COAHUILA: Torreon, under bushes on banks of Rio Nazas, 1898, Palmer 509. CHIHUAHUA: Cieneguita, wet arroyo bottom, Johnston & Muller 1417; Los Medanos, 1935, LeSueur 64; near the Sacramento, Chihuahua, Sept. 16, 1886, Pringle 812; 20 km. south of Camargo, Harvey 1385.

Texas to Arizona and south to Central America.

Eriochloa punctata (L.) Desv. ex Hamilt. Prodr. Ind. Occ. 5 (1825).

COAHUILA: Monclova, Harvey 1147.

Louisiana and eastern Texas south in eastern Mexico to Vera Cruz; South America.

Brachiaria Meziana Hitchc. Contr. U. S. Nat. Herb. **12**: 140 (1908).

COAHUILA: Saltillo, along irrigation ditch, 1910, Hitchcock 402. CHIHUAHUA: Valley near Chihuahua, Sept. 20, 1885, Pringle 375.

Coahuila and Chihuahua south to Oaxaca.

Paspalum distichum L. Syst. Nat. ed. 10, **2**: 855 (1759).

COAHUILA: Saltillo, 1898, Palmer 259, 391. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, wet sandy arroyo, Stewart 2401; 5 km. west of Camargo, Harvey 1407. DURANGO: Mapimi, 1898, Palmer 553.

Along streams and ditches and other wet places, widely distributed in America.

Paspalum pubiflorum Rupr. ex Fourn. Mex. Pl. **2**: 11 (1886).

COAHUILA: Yerda Spring, Marsh 292; Santa Anna Canyon, Marsh 435; Palm Canyon, Marsh 324; Muzquiz, Marsh 1156; Mesa Grande, northwest of Hac. Encantada, wet arroyo, fairly common, Stewart 1619; Hermanas, Marsh 2259; Monclova, Marsh 1721; 50 km. south of Monclova, Harvey 1126; Sierra Hechiceros, Cañon Indio Felipe, creek bank, Stewart 91; Sierra Cruces, Cañon Tinaja Blanca, arroyo bank,

erect, *Stewart* 1133; Torreon, 1898, *Palmer* 515; Jimulco Springs, May 13, 1885, *Pringle* 427. CHIHUAHUA: Sierra Almagre, Ojo Almagre, about spring, becoming 6 ft. tall, *Johnston & Muller* 1201; near Chihuahua, by streams, Sept. 1885, *Pringle* 374; 5 km. west of Camargo, *Harvey* 1405a.

Louisiana and Texas south to southern Mexico.

Paspalum erinitum Chase in Hitchc. Contr. U. S. Nat. Herb. **17**: 237 (1913).

COAHUILA: Chojo Grande, 27 mi. southeast of Saltillo, about summit of waterfall in moist place, 1904, *Palmer* 338.

Reported by Chase, Contr. U. S. Nat. Herb. **28**: 61 (1929) from Coahuila, San Luis Potosi, Jalisco, and Puebla.

Paspalum Hartwegianum Fourn. Mex. Pl. **2**: 12 (1886).

COAHUILA: 24 km. east of Don Martin Dam, *Harvey* 949.

Texas south to southern Mexico.

Paspalum mutabile Chase, Contr. U. S. Nat. Herb. **28**: 61 (1929).

COAHUILA: Palm Canyon, Muzquiz area, *Marsh* 978.

Northeastern Mexico south to Hidalgo.

Paspalum ciliatifolium Michx. Fl. Bor. Am. **1**: 44 (1803).

CHIHUAHUA: Los Medanos, 1935, *LeSueur* 62.

A very variable species of sandy soils, widely distributed in the eastern half of the United States; reported from the West Indies and Central America. The cited collection is an unusually glabrous plant and keys to *P. propinquum* in Chase's monograph. I am, however, perfectly content to refer it to typical *P. ciliatifolium*; cf. *Rhodora* **36**: 21 (1934). Chase cites a collection of *P. stramineum* Nash from near Juarez, Chihuahua ("Paso del Norte, *Pringle* 1123"). This is presumably a form of the present species with puberulent foliage and somewhat hairy fruit, i.e. the var. *stramineum* (Nash) Fernald.

Panicum ramisetum Scribn. U. S. Dept. Agric., Div. Agrost. Cir. **27**: 9 (1910).

COAHUILA: Rio Grande Valley near Piedras Negras, April 23, 1900, *Pringle* 8323.

Texas south into adjoining Coahuila. The present species probably should be united with *P. Reverchoni* Vasey (1889), an older species having practically the same geographical distribution.

Panicum lanuginosum Ell. var. **Lindheimeri** (Nash) Fernald, *Rhodora* **36**: 77 (1934).

COAHUILA: Muzquiz, *Marsh* 1171; Cañon Agua Grande, west of Las Delicias, by water, erect, *Stewart* 2800.

A phase of a variable species widely distributed in the eastern United States. Although ranging with the other variants of the species farther northward and eastward, the present glabrous form is the most common, if not the only, phase of the species in south central and trans-Pecos Texas.

Panicum oligosanthes Schultes, var. **Scribnarianum** (Nash) Fernald, *Rhodora* **36**: 80 (1934).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller* 519; Sierra Hechiceros, Cañon Indio Felipe, common on creek bank, *Stewart* 74.

Widely distributed in the United States; in Mexico known only from Coahuila.

Panicum pedicellatum Vasey, U. S. Dept. Agric., Div. Bot. Bull. **8**: 28 (1889).

COAHUILA: Sierra Madera, Cañon Charretera, common in gravelly bed of arroyo in oak belt, *Johnston* 8919.

Central Texas and eastern Coahuila.

Panicum fasciculatum Sw. Prodr. Veg. Ind. Occ. 22 (1788).

Panicum fasciculatum var. *reticulatum* Beal, Grasses No. Am. **2**: 117 (1896).

CHIHUAHUA: Plains near Chihuahua, Sept. 2, 1885, *Pringle* 379, 380; 6 mi. west of Piloncillo, low place in grassland, *Johnston* 7863.

Florida; Texas to Arizona and south into South America.

Panicum arizonicum Scribn. & Merr. U. S. Dept. Agric., Div. Agrost. Cir. **32**: 2 (1901).

COAHUILA: San Antonio de los Alamos, summit of tuff cliffs, gravelly flat, two plants only, *Johnston* 8250. CHIHUAHUA: $7\frac{1}{2}$ mi. south of Pirámide, silty flat, flooded by storm-water, rare, *Johnston* 8100; 10 mi. southeast of Organos, fairly abundant on gentle grassy slope, *Stewart & Johnston* 2034; north of El Carmen, 1935, *LeSueur* 69; Chihuahua, *Pringle* 487 (US); Meoqui, 1935, *LeSueur* 37; 20 km. south of Camargo, *Harvey* 1391.

Trans-Pecos Texas to southern California and south in western Mexico to Oaxaca.

Panicum hirticaule Presl, Rel. Haen. **1**: 308 (1830).

COAHUILA: Rancho Las Uvas, east side Valle Acatita, shale on slope, *Stewart* 2701. CHIHUAHUA: Llano Chilicote, 7 mi. east of Chilicote Station, grassy flat, *Johnston* 7992; Chihuahua, 1935, *LeSueur* 12; Meoqui, 1935, *LeSueur* 32; 20 km. south of Camargo, *Harvey* 1378; 6 mi. west of Piloncillo, lava hillside, *Johnston* 7866.

Texas to southern California and south to South America. An annual species, becoming large and coarse in the tropics. Our reduced northern form is 1–3 dm. tall.

Panicum filipes Scribn. ex Heller, Contr. Herb. Frankl. Marsh. College **1**: 13 (1895).

COAHUILA: El Berrendo, *Harvey* 1186.

Texas and eastern Coahuila.

Panicum Hallii Vasey, Bull. Torr. Bot. Cl. **11**: 64 (1884).

COAHUILA: Yerda Spring, *Marsh* 288; Santa Anna Canyon, *Marsh* 427; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh* 1278; 2 mi. northwest of Fronteras, road to Natadores, silty desert plain, *Johnston* 7170; near Rancho Santa Teresa, south of Castaños, *Wynd & Mueller* 174; mountains west of Saltillo, 1880, *Palmer* 1338; hills 20 mi. west of Saltillo, *Shreve & Tinkham* 9821; Sierra del Pino, La Noria, meadows and arroyo-bank, *Johnston & Muller* 467, 694, *Stewart* 1211; Sierra Madera, Cañon Charretera, ledges on sunny slope in oak belt, *Johnston* 9104; 14 mi. east of Paila, *Shreve & Tinkham* 9897; San Antonio de los Alamos, gravelly flat on top of tuff cliffs, *Johnston* 8250; Sierra Cruces, 8 mi. north of Santa Elena, stony flat, *Johnston & Muller* 1017; 7 mi. south of Jaco, about mogote, *Johnston & Muller* 1111. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, rocky slope, *Stewart* 2395; Coahuilan boundary a mile east of Pozo de Villa, silty plain, *Johnston* 8175; Sierra Santa Eulalia, Aug. 1885, *Pringle* 376.

Texas to Arizona and south to Hidalgo and Durango.

Panicum lepidulum Hitchc. & Chase, Contr. U. S. Nat. Herb. **15**: 75 (1910).

Based upon *Pringle* 487, collected Sept. 22, 1885, by stream in rocky hills near (west of) Chihuahua, the type, and on material from Durango and the Federal District. I have not seen the type collection. The other

specimens originally cited, however, suggest that it may possibly be only a form of *P. Ghiesbreghtii* Fourn.

Panicum bulbosum H.B.K. Nov. Gen. et Sp. 1: 99 (1815).

COAHUILA: Sierra del Carmen, Aug. 26, 1936, *Marsh* 630; Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller* 514; Sierra Gloria, *Marsh* 1875. CHIHUAHUA: River canyon west of Chihuahua, moist places, Aug. 7, 1885, *Pringle* 377.

Trans-Pecos Texas to Arizona and south to Oaxaca.

Panicum virgatum L. Sp. Pl. 59 (1753).

Panicum plenum Hitchc. & Chase, Contr. U. S. Nat. Herb. 15: 80 (1910).

COAHUILA: Sierra del Pino, head of Cañon Ybarra, dry hillside, *Stewart* 1248; Sierra del Pino, La Noria, arroyo banks, *Johnston & Muller* 465. CHIHUAHUA: Pirámide, low ground, coarse clumps 2-4 ft. tall, *Johnston* 8140.

United States, except the Pacific States, south to Central America.

Panicum Havardii Vasey, Bull. Torr. Bot. Cl. 14: 95 (1887).

CHIHUAHUA: Los Medanos, 1935, *LeSueur* 82.

Extreme western Texas, eastern New Mexico, and northern Chihuahua, in sandy places. Hitchcock & Chase, Contr. U. S. Nat. Herb. 15: 94 (1910), report a collection from "Paso del Norte, *Pringle* 1124."

Panicum agrostoides Spreng. Pl. Pugil. 2: 4 (1815).

Panicum condensum Nash in Small. Fl. S. E. U. S. 93 (1903).

COAHUILA: Muzquiz Swamp, 1936, *Marsh* 928.

Eastern United States and northeastern Mexico.

Panicum obtusum H.B.K. Nov. Gen. et Sp. 1: 98 (1816).

VERNACULAR NAME: Zacate Gramilla.

COAHUILA: Open country between Rancho Santo Domingo and Hac. Piedra Blanca, *Wynd & Mueller* 486; Santa Anna Canyon, *Marsh* 463; Yerda Spring, *Marsh* 964; vicinity of Encantada Ranch headquarters and eastward, July 27 or 28, 1938, *Marsh* 1514, 1535; desert near Rancho Santa Teresa, south of Castaños, *Wynd & Mueller* 204; Saltillo, in graveyard, 1898, *Palmer* 394; 24 km. northwest of Fraile, south slope of mountain, *Stanford et al.* 397a; La Ventura, *Nelson* 3908 (US); Torreon, overflowed land, 1898, *Palmer* 504; 5 km. northeast of Jimulco, dry canyon, *Stanford et al.* 125; Sierra del Pino, 10 km. southwest of La Noria, dry hillside, *Stewart* 1266a; Sierra del Pino, La Noria, meadow on flat, *Johnston & Muller* 698; Sierra Cruces, 3 km. west of Santa Elena, black loamy flat, *Stewart* 834; charco on plain southeast of Almagre, wet meadow, *Johnston & Muller* 1225. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, wet sandy arroyo, *Stewart* 2398; 2 mi. west of Pozo de Villa, sabaneta, *Johnston* 8164; Llano de Chilicote, flats 7 mi. east of Chilicote Station, *Johnston* 7990; Chihuahua, *Pringle* 476 (US); south of Chihuahua, 1936, *LeSueur* 131; 10 km. east of Jimenez, *Harvey* 1349. ZACATECAS: Concepcion del Oro, cemetery, 1904, *Palmer* 266; mountain 18 km. west of Concepcion del Oro, *Stanford et al.* 582.

Missouri and Texas to Colorado and Arizona, and south to central Mexico. Growing in wet soil or low places where storm water frequently collects.

Oplismenus hirtellus (L.) Beauv. Ess. Agrost. 54, 168 (1812).

COAHUILA: Palm Canyon near Muzquiz, Sept. 19, 1936, *Marsh* 985.

Northern Mexico to Argentina.

Echinochloa colonum (L.) Link, Hort. Berol. 2: 209 (1833).

COAHUILA: Sierra del Carmen, Aug. 29, 1936, *Marsh* 699; Santa Anna Canyon,

Marsh 428, 431; Sabinas River, Muzquiz, *Marsh* 405; El Berrendo, *Harvey* 1179; Monclova, *Marsh* 1844; 12 km. north of Agritos, damp arroyo, *Stewart* 1282; Llano de Guaje, 5 km. west of mouth of Cañon Ybarra, about tanque, *Stewart* 1920; Tanque Jerico, north of Rancho El Fuste, under bushes near tank, *Johnston* 8342; Parras, bottom-land, 1898, *Palmer* 454; Torreon, under bushes along Rio Nazas, 1898, *Palmer* 508. CHIHUAHUA: Presidio del Norte, *Bigelow*; Presa de Chihuahua, *LeSueur* 134; Sierra Organos, *LeSueur* 176; Jimenez, banks of Rio Florida, *Harvey* 1330.

A European weed, widely distributed in gardens and bottom-lands.

Echinochloa Walteri (Pursh) Heller, Cat. No. Am. Pl. ed. 2, 21 (1900).

COAHUILA: Muzquiz Swamp, *Marsh* 891.

Eastern United States south to Texas and northern Coahuila.

Echinochloa crus-galli (L.) Beauv. Ess. Agrost. 53 (1812).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh* 751; Hermanas, *Marsh* 1576; Cuatro Cienegas, 1939, *Marsh* 2023; Saltillo, 1898, *Palmer* 380, 418. CHIHUAHUA: Presa de Chihuahua, *LeSueur* 135.

Widely distributed weedy plant in gardens and wet soils.

Chaetium bromoides (Presl) Benth. ex Hemsl. Biol. Centr. Am. Bot. 3: 503 (1885).

Hitchcock, Contr. U. S. Nat. Herb. 17: 259 (1913), reports this species from "CHIHUAHUA: Chihuahua, *Palmer* in 1886." The data on the specimen is possibly erroneous. Except for this specimen, the species is known only from central Mexico south into Central America.

Setaria lutescens (Weigel) Hubbard, Rhodora 18: 232 (1916).

CHIHUAHUA: 5 km. west of Camargo, 1939, *Harvey* 1413.

A European weed, widely distributed in temperate North America.

Setaria geniculata (Lam.) Beauv. Ess. Agrost. 51, 178 (1812).

COAHUILA: 20 mi. northwest of La Babia, open valley floor, *Wynd & Mueller* 431; Santa Anna Canyon, *Marsh* 434; Sabinas River, Muzquiz, *Marsh* 396; Muzquiz Swamp, *Marsh* 936; valley below Saltillo, frequent, 2 ft. tall, Sept. 23, 1848, *Gregg* 536; Saltillo, 1898, *Palmer* 383; Parras, 1898, *Palmer* 451; Jimulco Springs, May 13, 1885, *Pringle* 431. CHIHUAHUA: Chihuahua, *LeSueur* 138.

Southeastern United States west to Texas and south to Argentina. The type of *Chaetochloa gibbosa* Scribn. & Merr., referred to *C. macrostachya* by Hitchcock, Contr. U. S. Nat. Herb. 22: 204 (1920), properly belongs in the synonymy of the present species.

Setaria verticillata (L.) Beauv. Ess. Agrost. 51, 178 (1810).

COAHUILA: Monclova, 1939, *Marsh* 1841; Parras, shaded garden, 1898, *Palmer* 453. CHIHUAHUA: Presa de Chihuahua, 1936, *LeSueur* 137.

A European weed.

Setaria Grisebachii Fourn. Mex. Pl. 2: 45 (1886).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh* 762; Jardin del Sur, Sept. 3, 1936, *Marsh* 776; Sierra Guajes, Cañon Madera, east of Buena Vista, hillside, *Stewart* 1503; Palm Canyon, *Marsh* 983; Saltillo, in garden, 1898, *Palmer* 385; San Lorenzo Canyon, 6 mi. southeast of Saltillo, mouth of canyon, 1904, *Palmer* 397; Chojo Grande, shade of rocky ledges, 1904, *Palmer* 336, 337; Sierra del Pino, La Noria, hillsides and meadows, *Stewart* 1206; San Antonio de los Alamos, talus at base of cliffs, *Johnston* 8275. CHIHUAHUA: 7 mi. northwest of Temporales de Honorato, abundant in mogote, *Stewart & Johnston* 1989; Chihuahua, *LeSueur* 25; rocky hills northeast of Chihuahua, shaded places, Sept. 16, 1885, *Pringle* 381.

Texas to Arizona and south to southern Mexico. A native annual, very suggestive of *S. verticillata* in general habit.

Setaria macrostachya H.B.K. Nov. Gen. et Sp. 1: 110 (1816).

Chaetochloa leucopila Scribn. & Merr. U. S. Dept. Agric., Div. Agrost. Bull. 21: 26 (1900).

Setaria leucopila Schum. in Just's Bot. Jahresb. 28¹: 417 (1902).

COAHUILA: Allende, *Marsh* 1791; Sierra del Carmen, Aug. 8, Sept. 6 and 13, 1936, *Marsh* 687, 852, 903; northwest of Hac. La Babia, open valley floor, *Wynd & Mueller* 441; Cañon Milagro, Sierra Guajes, shaded places, *Stewart* 1707; trail from south end of Hillcoat Mesa to Buena Vista headquarters, July 27, 1938, *Marsh* 1504; Cuatro Cienegas, *Marsh* 2027, *Harvey* 1209a; Monclova, *Marsh* 1696; Saltillo, 1898, *Palmer* 378; east base of Picacho del Fuste, about bushes on flat, *Johnston* 8433; north of Sierra Cruces, about mogote west of San Rafael, *Johnston & Muller* 1041; Sierra Cruces, sunny hillside 5 km. west of Santa Elena, *Stewart* 833; Parras, 1880, *Palmer* 1363 (isotype of *S. leucopila*); Parras, 1898, *Palmer* 449. CHIHUAHUA: Silty plain on Coahuilan boundary 1 mi. east of Pozo de Villa, *Johnston* 8174; Rancho El Pino, southeast of Sierra Rica, rocky slope, *Stewart* 2396; Los Medanos, 1935, *LeSueur* 55; 20 km. south of Camargo, *Harvey* 1383. ZACATECAS: Concepcion del Oro, 1904, *Palmer* 261.

Central and southern Texas to Arizona and south to Central America. A very variable species in height, leaf-width, and size and form of the spike, apparently in response to varying ecological conditions. Our common form has the leaves less than 8 mm. broad, the spike cylindrical, and the plant usually 4–8 dm. tall. It has been described as *S. leucopila*. More vigorous plants have leaves 10–15 mm. wide, the plant over a meter tall, and the spike cylindrical or broadest below the middle and more or less attenuate above. Typical *S. macrostachya* is this large form with cylindrical spike. From the large forms with attenuate inflorescence there are numerous transitions to *S. Scheelei*, a more robust plant with more or less branched open inflorescence.

Setaria Scheelei (Steud.) Hitchc. Proc. Biol. Soc. Wash. 41: 163 (1928).

COAHUILA: Torreon, 1898, *Palmer* 505. CHIHUAHUA: Ojo Almagre, Sierra Almagre, about spring, 6 ft. tall, *Johnston & Muller* 1202.

Texas and northeastern Mexico. *Setaria villosissima* (Scribn. & Merr.) Schum. is probably a synonym of this species.

Cenchrus myosuroides H.B.K. Nov. Gen. et Sp. 1: 115 (1816).

COAHUILA: Santa Anna Canyon, *Marsh* 437; Saltillo, *Hitchcock* 5647 (US); Cienega Grande, May 18, 1847, *Gregg* 702; Tinaja del Norte, Sierra Cruces, 25 km. northwest of Santa Elena, among rocks in shaded canyon, not common, *Stewart* 2151. CHIHUAHUA: Wet places near Chihuahua, May 25, 1885, *Pringle* 429; Meoqui, 1936, *LeSueur* 140; 60 km. north of Escalon, *Harvey* 1302.

Texas (Uvalde to Brewster Counties) south through Mexico to South America.

Cenchrus echinatus L. Sp. Pl. 1050 (1753).

COAHUILA: Monclova, 1880, *Palmer* 1343; Monclova, 1939, *Marsh* 1831.

Chase, Contr. U. S. Nat. Herb. 22: 61 (1920), reports the species from Torreon (*Hitchcock* 7558). Texas to Arizona and south into tropical America.

Cenchrus pauciflorus Benth. Bot. Voy. Sulphur 56 (1840).

VERNACULAR NAME: Chancaquilla.

COAHUILA: On desert 25 mi. southwest of Sabinas, *Wynd & Mueller* 218; Rancho Agua Dulce, valley floor, *Wynd & Mueller* 404; 20 mi. northwest of Hac. La Babia, valley floor, *Wynd & Mueller* 444; Yerda Spring, 1936, *Marsh* 287; Hac. Encantada, abundant on flats, 1941, *Stewart* 1733; Monclova, 1939, *Marsh* 1823; near Esmeralda, fairly common along arroyo, *Stewart* 2179; Cañon Agua Grande, west of Las Delicias, on flats, common, *Stewart* 2825. CHIHUAHUA: 1935, *LeSueur* 7; 20 km. south of Camargo, 1939, *Harvey* 1393.

Chase, Contr. U. S. Nat. Herb. **22**: 71 (1920), reports the species from Saltillo. This species is probably indigenous to Mexico and Texas and was formerly much less generally distributed than at present. It has become a widely distributed and obnoxious weed along roads and about towns in waste ground. Chase refers the common, apparently indigenous *Cenchrus* of central United States to *C. pauciflorus*, but that seems doubtfully correct, for the broader darker green leaves and the shape and armature of the burs of that plant are more suggestive of *C. echinatus*.

Imperata brevifolia Vasey, Bull. Torr. Bot. Cl. **13**: 26 (1886).

Imperata Hookeri (Anderss.) Hack. in DC. Monogr. Phan. **6**: 97 (1889).

Collected in the bottoms of the Rio Grande on the Texan side of the river between El Paso and old Fort Quitman, and almost certainly to be found on the Chihuahuan side also.

Andropogon hirtiflorus (Nees) Kunth, Rév. Gram. **1**: Suppl. xxxix (1830).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller* 548. CHIHUAHUA: Sierra Organos, common on oak-clad slopes south of Organos, *Stewart & Johnston* 2069; rocky hills northeast of Chihuahua, Aug. 29, 1885, *Pringle* 383.

Trans-Pecos Texas to Arizona and south into tropical America. Our plants represent the Mexican var. *feensis* (Fourn.) Hitchc. The plant closely resembles *A. scoparius* and *A. cirratus*, from which it differs chiefly in the scabrid strigose hairy glumes.

Andropogon cirratus Hack. Flora **68**: 119 (1885).

CHIHUAHUA: Rocky hills northeast of Chihuahua, Oct. 17, 1885, *Pringle* 382.

Southeastern Arizona to trans-Pecos Texas (east to the Davis Mts.) and south into Chihuahua and eastern Sonora. Closely related to *A. scoparius* and probably only a well-marked geographical variety, differing in having the hairs on the spikelet and pedicels scanty or nearly absent.

Andropogon scoparius Michx. Fl. Bor. Am. **1**: 57 (1803).

COAHUILA: Sierra del Carmen, Aug. 26, 1936, *Marsh* 607; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh* 1272; Hillcoat Mesa, lying west of Encantada Ranch, July 25, 1938, *Marsh* 1433; Sierra del Pino, La Noria, along arroyo bottom and on rocky flats among scrub-oaks, *Johnston & Muller* 449, 661; tableland north of Cañon Cuervo Chico, rocky slopes of low rounded limestone hills, *Johnston* 8558.

Eastern United States west to Idaho and northern Arizona, apparently entering Mexico only in northern Coahuila. Our material falls into the var. *neomexicana* (Nash) Hitchcock, cf. Rhodora **37**: 143 (1935).

Andropogon virginicus L. var. **tenuispathaeus** (Nash) Fern. & Grisc. Rhodora **37**: 142 (1935).

COAHUILA: Cañon Agua Grande, west of Las Delicias, near water, erect, 3 m. tall, scarce, *Stewart* 2818.

Wet ground from southeastern United States to California and south into tropical America.

Andropogon ternarius Michx. Fl. Bor. Am. **1**: 57 (1803).

COAHUILA: Sierra de los Guajes, Cañon Madera, fairly abundant on hillsides, Stewart 1504; Sierra Madera, Cañon Charretera, rocky bed of open arroyo in oak belt, common, becoming 4 ft. tall, Johnston 9074.

Delaware to Missouri and south to Florida and central Texas, entering Mexico only in northern Coahuila.

Andropogon Hallii Hack. Sitzungsb. Akad. Wiss. Wien **89¹**: 127 (1884).

CHIHUAHUA: Los Medanos, 1935, LeSueur 61.

Sandy places from North Dakota to Utah, and south to Arizona and trans-Pecos Texas and northern Chihuahua.

Andropogon Gerardi Vitman, Summa Pl. **6**: 16 (1792).

Andropogon furcatus Muhl. ex Willd. Sp. Pl. **4**: 919 (1806).

COAHUILA: Sierra del Pino, meadows in the pine forests north of La Noria, common and conspicuous, Johnston & Muller 542, Stewart 1226.

Widely distributed in eastern and central United States. Known in Mexico only in Coahuila.

Andropogon saccharoides Sw. Prodr. 26 (1788).

Andropogon barbinodis Lag. Gen. et Sp. Nov. 3 (1816).

Andropogon perforatus Trin. ex Fourn. Mex. Pl. **2**: 59 (1886).

VERNACULAR NAME: Zacate aceite.

COAHUILA: Sierra del Carmen, July 29, 1936, Marsh 638; Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, Marsh 1313; Hillcoat Mesa, lying west of Encantada Ranch, July 25, 1938, Marsh 1435; Hermanas, Marsh 1628 and 2254; Monclova, 1880, Palmer 1347; Monclova, Marsh 1692; desert near Rancho Santa Teresa, Wynd & Mueller 207; 2 mi. west of Saltillo, Harvey 1096; Saltillo, 1898, Palmer 4, 261, 810; Sierra del Pino, La Noria, Stewart 1212, Johnston & Muller 667; Sierra Madera, Cañon Charretera, bed of arroyo, Johnston 9075; 10 km. southwest of El Oro, on bajillo, Stewart 3028; Sierra Jimulco, 5 km. northeast of Jimulco, Stanford et al. 132. CHIHUAHUA: Vicinity of Rancho El Pino, 10 km. southeast of Sierra Rica, rocky slopes, Stewart 2410; near Juarez, May 30, 1888, Pringle 1994; Agua Caliente, 1935, LeSueur 51; Chihuahua, 1935, LeSueur 2; arroyo 20 km. south of Camargo, Harvey 1382, 1389; 6 mi. west of Piloncillo, grassland, Johnston 7879. ZACATECAS: Concepcion del Oro, 1904, Palmer 262.

Alabama and Missouri west to southern California and south to Argentina. A variable widely spread species which I am here accepting in the broad sense used by Hackel in his monumental treatment of the genus. Attempts to segregate out certain forms, such as *A. barbinodis*, by stressing length of peduncle, hairiness of the nodes, shape of panicle, size of spikelets, etc., have been singularly unsuccessful but persistent. The characters used show little tendency to vary together and some of them are probably associated with the vigor and rapidity of growth. Significantly, these segregates and the restricted species have practically the same geographical distribution in Mexico and the United States and commonly may be detected in the same locality. Some plants of *A. saccharoides* have a conspicuous pore developed on the glumes and have been distinguished as *A. perforatus*. The distribution of the form is sporadic and may occur in

plants referred either to *A. saccharoides* or to *A. barbinodis*. Pitted glumes are known in other species of *Andropogon*. I see no reason why the development should be given specific recognition in the present case.

Sorghum halepense (L.) Pers. Syn. Pl. 1: 101 (1805).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh* 760; trail from the southern end of Hillcoat Mesa to Buena Vista headquarters, July 27, 1938, *Marsh* 1508; Santa Anna Canyon, *Marsh* 436; Monclova, *Marsh* 1663; Saltillo, weed in field, *Hitchcock* 5649 (US). CHIHUAHUA: Arroyo 20 km. south of Camargo, *Harvey* 1398.

A Mediterranean grass, now widely introduced into the warmer parts of America. A serious weed in irrigated lands, particularly in the Laguna District.

Sorghastrum nutans (L.) Nash in Small, Fl. S. E. U. S. 66 (1903).

COAHUILA: Palm Canyon near Muzquiz, *Marsh* 986.

Eastern United States and south into Mexico.

Heteropogon contortus (L.) Beauv. ex R. & S. Syst. Veg. 2: 836 (1817).

COAHUILA: Sierra del Carmen, Aug. 22, 1936, *Marsh* 583; igneous hill near Santo Domingo, *Wynd & Mueller* 470; Palm Canyon, near Muzquiz, *Marsh* 993; Puerto del Norte, Cuatro Cienegas, *Harvey* 1206; Monclova, 1880, *Palmer* 1346; Puerto Santo Lazaro, Sierra Gavia, *Muller* 3070; limestone hills near Santa Rosa, *Shreve & Tinkham* 9582; 14 mi. east of La Paila, *Shreve & Tinkham* 9893; Sierra Cruces, stony flats between bushes 8 mi. north of Santa Elena, *Johnston & Muller* 1018. CHIHUAHUA: Sierra Organos, 1937, *LeSueur* 161; Sierra Santa Eulalia, *Pringle* 480; Meoqui, 1936, *LeSueur* 141; 13 km. southwest of Jimenez, *Harvey* 1340.

Florida to Arizona and southward; widely distributed in the warmer parts of the world. Although growing on limestone, this species is more abundant on igneous rocks, particularly basalt. Usually growing on rocky slopes and at times dominating large areas.

Heteropogon melanocarpus (Ell.) Benth. Jour. Linn. Soc. Bot. 14: 71 (1882).

Hitchcock, Contr. U. S. Nat. Herb. 17: 212 (1913), cites a collection from the Mapula Mts., Chihuahua, *Pringle* 820. The species is widely distributed in the warmer parts of the world and extends north through western Mexico to Arizona.

Trachypogon Montufari (H.B.K.) Nees, Agrost. Bras. 342 (1829).

CHIHUAHUA: Rocky flat just east of Organos, locally common on ledges, *Stewart & Johnston* 2059; Chihuahua, *LeSueur* 15.

Southern and eastern Texas; Arizona; Mexico to Argentina.

Elyonurus barbiculmis Hack. in DC. Monogr. Phan. 6: 339 (1889).

CHIHUAHUA: Rocky flats just east of Organos, locally common about ledges, leaf-tufts bright green, *Stewart & Johnston* 2058; west of Chihuahua, 1935, *LeSueur* 14; Cerro Coronel, Chihuahua, rocky hills, Aug. 5, 1885, *Pringle* 423.

Trans-Pecos Texas to Arizona and south to Durango.

Manisuris altissimus (Poir.) Hitchc. Jour. Wash. Acad. 24: 292 (1934).

COAHUILA: Sabinas River, near Muzquiz, 1936, *Marsh* 404.

Wet places in the warmer parts of the world; introduced into America. The species has been collected repeatedly on the Texan bank of the river in the Big Bend of the Rio Grande.

Hackelochloa granularis (L.) Kuntze, Rev. Gen. 2: 776 (1891).

CHIHUAHUA: Open canyon in igneous hills 20 km. north of Chihuahua, sprawling in moist gravel, rare, Stewart & Johnston 2128; hills near Chihuahua, Pringle 1057 (US).

Arizona south through Chihuahua to Central America. A weedy grass widely distributed in the warmer parts of the world. Said to be introduced in our area, but, if so, introduced at a very early date, for it was collected at unfrequented places in southeastern Arizona by Charles Wright as early as 1851.

Coix lacryma-jobi L. Sp. Pl. 972 (1853).

COAHUILA: Saltillo, July 1880, Palmer 1337.

A species of the Old World tropics, widely cultivated in America for its bead-like fruits and frequently spontaneous.

Tripsacum dactyloides L. Syst. Nat. ed. 10, 1261 (1759).

Tripsacum dactyloides var. *occidentale* Cutler & Anderson, Ann. Mo. Bot. Gard. 28: 258 (1941).

COAHUILA: Sierra del Carmen, Cañon Sentenela, Wynd & Mueller 536; Sierra Encantada, 7 km. west of Buena Vista, fairly common in wet canyon, Stewart 1450; Santa Anna Canyon, Marsh 438; Palm Canyon, near Muzquiz, Marsh 982.

Connecticut to Iowa and south to Florida and through Texas and northeastern Mexico to San Luis Potosi. Hitchcock, and recently Cutler & Anderson, have placed the *Tripsacum* of northeastern Mexico in *T. lanceolatum* Rupr. I am, however, unable to separate Texan specimens from those collected in Coahuila, Nuevo Leon, Tamaulipas, and eastern San Luis Potosi. Characters in the size, shape, and surface of the segments of the female inflorescence readily separate these specimens from the more southerly and westerly *T. lanceolatum*.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

PLANTAE PAPUANAE ARCHBOLDIANAE, XIII*

E. D. MERRILL AND L. M. PERRY

MELASTOMATACEAE

OUR study of the Melastomataceae as represented by the material from the Richard Archbold Expeditions to New Guinea and the specimens collected by Brass and Kajewski in the Solomon Islands follows the basic work of Mansfeld, *Bot. Jahrb.* **60**: 105–143. 1925. We have found nothing new in the Osbeckieae, Oxysporeae, or Sonerileae. In the Dissochaeteae the only new records we have are of *Medinilla* Gaudichaud. The genus is so diverse or variable in character that we have accepted Mansfeld's interpretation, although we are not wholly convinced that *Hederella* Stapf rightfully belongs here. In the Papuan material the new species may be readily placed in Mansfeld's key, and for the convenience of future workers we have inserted a running key patterned after that of Mansfeld. For the consideration of the Solomon Islands material, it may be helpful to note one particular point. Towards the end of Mansfeld's key, p. 118, one finds the caption, "Flores bracteis persistentibus stipati" (flowers surrounded by persistent bracts). The only authentic material available for comparison in this group was a very fragmentary specimen of *M. Schlechteri* Mansfeld, an isotype, and in the unnamed collections a specimen which we determined as representing *M. Pulleana* Mansf. In both of these species the bracts are always at the nodes of the inflorescences, the ultimate pair being at the base of the pedicel. On the other hand, in much of the Solomon Islands material the inflorescences are characterized not only by persistent bracts similarly placed, but in addition have a pair of persistent bracteoles (usually more showy and larger than the bracts) at the base of the calyx. This same feature is found in a number of Philippine species and also in those of Polynesia. Taken together, the species probably form a definite section of *Medinilla*, with a geographical range south from the Philippines, including the Solomon Islands, and eastward to western Polynesia (Fiji and Samoa). Another distinctive group in the Philippines, represented by *Cephalomedinilla* Merr., which we now believe ought to be considered as a section of *Medinilla*, also occurs in the Solomon Islands.

In most of the species with setose nodes, it has been somewhat difficult to characterize the pubescence satisfactorily. Mansfeld has used the term plumose-pilose, or, if the trichomes were shorter, furfuraceous. In most cases in our work this has been designated as subplumulose-pilose, for the projections forming the "feathery" part are mostly very short, sometimes hardly even barbellate, and are found either all along the main hair, or, in some instances, only at the base of it.

*Botanical Results of the Richard Archbold Expeditions. See *Jour. Arnold Arb.* **24**: 207–217. 1943.

In the Astronieae there are several new species of *Astronium* A. Gray, and in the Memecyleae one new species of *Memecylon* Linnaeus.

Medinilla Gaudichaud

- A. Leaves verticillate, opposite, or often appearing alternate, mostly equal in size, or if unequal, similar in shape; inflorescence bracteate or not, the flowers not bracteolate.
- B. Plants glabrous, or if pubescent, the nodes not setose.
- C. Leaves verticillate or opposite.
- D. Leaves verticillate.

Medinilla caulinflora Hemsl. Kew Bull. 1895: 135. 1895.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, *Kajewski* 1671, 1718, April 1930, alt. 950 m. and 1000 m., common on rain-forest trees; Koniguru, Buin, *Kajewski* 2142, August 1930, alt. 900 m., common on taller trees of rain-forest; Guadalcanal: without further locality, *Kajewski* 2644, May 1931.

The field-notes may be summarized as follows: plant up to 1.5 m. long; petals white; calyx light green; fruit dark red to black, up to 9 mm. long and 8 mm. diameter. This appears to be the first record of any collection of this species since the original description.

Medinilla quadrifolia Blume, Flora 509. 1831; Cogn. Monog. Phan. 7: 574. 1891; Mansf. Nov. Guin. Bot. 14: 203. 1924, Bot. Jahrb. 60: 119. 1925.

SOLOMON ISLANDS: Bougainville: Kugumaru, Buin, *Kajewski* 1986, July 1930, alt. 150 m., rain-forest (semi-scandent; fruit white when ripe, almost globose, 1 cm. diameter). Malaysia and New Guinea.

- D. Leaves always opposite.
- E. Leaves sessile or subsessile.

Medinilla Forbesii Bak. f. Trans. Linn. Soc. II. Bot. 9: 55. 1916; Mansf. Bot. Jahrb. 60: 121. 1925; vel aff.

NETHERLANDS NEW GUINEA: Balim River, *Brass* 11754, December 1938, alt. 2100 m., a few specimens in *Vaccinium* scrub (erect shrub 1 m. high; petals pale pink; ovary and pedicel red); 15 km. southwest of Bernhard Camp, Idenburg River, *Brass* 11899, January 1939, alt. 1800 m., mossy forest, frequent in open situations (large shrub 2 m. high; calyx and pedicels red; petals white).

With no material for comparison, we find it difficult to distinguish *Medinilla Forbesii* Bak. f., *M. novo-guineensis* Bak. f., and *M. Bakeriana* Mansf. Both specimens cited above have cymose inflorescences in lateral fascicles at the nodes. The other two species, according to the descriptions, have fascicled flowers. The leaves of *Brass* 11754 are smaller (11 × 6 cm.) than those of *Brass* 11899 (19 × 10 cm.), but the structure of the flowers is the same.

Medinilla Peekelii Mansf. Notizbl. Bot. Gart. Berl. 10: 282. 1928.

SOLOMON ISLANDS: Yabel: Maruto, *Brass* 3395, December 1932, alt. 300 m. (epiphytic shrub with pale fleshy leaves; flowers pale purple; fruit smooth, fleshy, red). The type was described from a collection made in the Bismarck Archipelago.

- E. Leaves petiolate.
- F. Flowers not solitary.

Medinilla Hollrungiana Mansf. Bot. Jahrb. 60: 120. 1925.

NETHERLANDS NEW GUINEA: Boemi, 40 km. from Nabire, *Kanehira & Hatusima*

12728, March 1940, alt. 300 m., in forest; Bele River, 18 km. northeast of Lake Habbema, Brass 11355, November 1938, alt. 2200 m., common in grassy second growths on river banks (upright shrub 2 m. high; leaves fleshy and brittle, the average size $\pm 14 \times 6$ cm.; flowers pink, with red calyx and pedicel). BRITISH NEW GUINEA: Mafulu, Brass 5180 (det. Markgraf), September - November 1933, alt. 1250 m., bed of creek in lower forest, rare (sparsely foliaged shrub 1 m. tall; leaves fleshy; numerous lateral fascicles of reddish pink flowers); Palmer River, 2 miles below junction of Black River, Brass 7114 (det. Markgraf), June 1936, alt. 100 m., occasional in a special swamp forest community in the ridges (semiscendent epiphytic shrub; leaves fleshy; flowers dark pink; fruit red). Described from Northeastern New Guinea.

Medinilla tenuipedicellata Bak. f. Trans. Linn. Soc. II. Bot. 9: 53. t. 3, f. 44-47. 1916.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, Brass 11878, 12066, January 1939, alt. 1800 m., mossy forest, gregarious in semi-shade (branches protruding ± 20 cm. above the thick ground moss; flowers pale purple-pink; — the second collection a shrub 60 cm. tall; calyx white, rimmed with red; petals pink).

Part of the material of these collections is an exact match for the plate, but the rest shows considerable variation in the size of the leaves, some of which are as large as 11 cm. long and 4 cm. broad.

Medinilla Versteegii Mansf. Bot. Jahrb. 60: 125. 1925.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, Brass 13714, March 1939, alt. 850 m., frequent on trees along river in rain-forest (epiphytic shrub about 1 m. high; flowers white; fruit red); Bernhard Camp, Idenburg River, Brass 13996, April 1939, alt. 50 m., frequent in flooded rain-forest of river plain (epiphytic shrub 2 m. high; flowers pinkish white; fruit red). BRITISH NEW GUINEA: Palmer River, 2 miles below junction of Black River, Brass 7198, 7254 (det. Markgraf), July 1936, alt. 100 m., common on river bank trees (large epiphytic shrub or small tree with brittle leaves; terminal panicles of waxy white flowers; fruit red, 6-7 mm. diameter). In Brass 7254 the inflorescences are lateral and axillary. The species has been reported previously for both Northeastern New Guinea and Netherlands New Guinea.

Medinilla exigua sp. nov.

Arbuscula epiphytica 2 m. alta glaberrima multiramosa; ramis teretibus cinereis; ramulis angulatis vel sulcatis nodosis; foliis oppositis similibus chartaceis ellipticis, 1.2-3 cm. longis, 0.7-1.5 cm. latis, basi anguste cuneatis, apice obtusis, trinerviis, nervis supra inconspicuis subtus distinctis; petiolo 4-9 mm. longo; floribus in cymas axillares vel terminales paucifloras (1-3) dispositis; pedunculo communi 3-6 mm. longo, bracteis minutis; pedicellis \pm 4 mm. longis; calycis tubo anguste obconico vix 3 mm. longo, limbo truncato 1 mm. longo; petalis 4, oblanceolatis, circiter 1 cm. longis, apice acutis; staminibus 8, antheris 3.5 mm. longis postice calcaratis, calcare 1 mm. longo, antice inappendiculatis; fructibus immaturis urceolatis.

NETHERLANDS NEW GUINEA: 18 km. southwest of Bernhard Camp, Idenburg River, Brass 12696 (TYPE), February 1939, alt. 2050 m., rain-forest of a ravine (profusely branched epiphytic shrub 2 m. high, with fragile white flowers and fleshy red fruit).

This species is readily distinguished by the small leaves, the angular branchlets, and the reduced cymes.

F. Flowers solitary.

Medinilla Erpetina Triana, Trans. Linn. Soc. 28: 87. t. 7, f. 94 d. 1871-73; Cogn. Monog. Phan. 7: 589. 1891.

Erpetina radicans Naud. Ann. Sci. Nat. III. 15: 299. t. 14. 1851.

SOLOMON ISLANDS: Ysabel: Mount Marescott, Brass 3260, December 1932, alt. 1000 m., mountain forests, common (small climber adhering closely to tree-trunks; leaves dark green, thick and somewhat fleshy; flowers purple; fruit red, fleshy); Tiratona, Brass 3531, December 1932, alt. 600 m., mountain forests, common (small root-climber; flowers reddish); Bougainville: Lake Luralu, Koniguru, Buin, Kajewski 2066, August 1930, alt. 1500 m., on rain-forest trees, common (vine; petals pink; stamens light yellow; style light red).

We suspect this is the species represented by *Medinilla nodosa* Fosberg, the main difference being in the more obtuse posticus appendage of the anther of the latter. However, since neither type is available for examination at present, it seems best only to call attention to the very strong resemblance between the two. Fosberg suggests that his species is closest to *M. acutifolia* Hemsl. from the Solomon Islands. From the context, the latter name is undoubtedly an error for *M. cauliflora* Hemsl.

C. Leaves, although opposite, often appearing alternate; inflorescence mostly borne on verrucae (*Hederella Stapf*).

Medinilla longistylis Mansf. Bot. Jahrb. **60**: 124. 1925.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction of Black River, Brass 7044 (det. Markgraf), June 1936, alt. 100 m., on a ridge crest (climbing to the crown of a very tall tree, the slender branches pendent 6–8 m. below the limbs of the tree; upper surface of leaves shining, the nerves deeply impressed above, prominent below; flowers pink). The species is recorded previously only from the type, collected in Northeastern New Guinea.

Medinilla lysipetala (F. v. Muell.) Mansf. Bot. Jahrb. **60**: 124. 1925; vel. aff.

Catanthera lysipetala F. v. Muell. Jour. Bot. **24**: 289. 1886.

Medinilla anomala Cogn. Monog. Phan. **7**: 1185. 1891.

Hederella Forbesii Stapf in Hook. Icon. **25**: t. 2415. 1895.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, Brass 12302, January 1939, alt. 1800 m., frequent in mossy forest (root-climbing epiphyte; leaves convex; unopened flowers a dark reddish pink); 8 km. southwest of Bernhard Camp, Idenburg River, Brass 12726, February 1939, alt. 1600 m., common in open situations in mossy forest (leaves stiff, convex; flowers dark rose, not opening widely).

The material cited above and other material in our herbarium, from Northeastern New Guinea, show a considerable amount of variation, but we have been unable to distinguish more than one species in it. We are not at all sure that it belongs to *Medinilla lysipetala* (F. v. Muell.) Mansf., but it seems best to place it here provisionally. It is to be noted that the type was collected near the base of the Owen Stanley Range, whereas the material above cited shows a higher altitude. Mueller describes the leaves as strongly 5-nerved from near the base, but these collections have obviously 3-nerved leaves. The inflorescences are axillary as well as lateral.

B. At least the nodes setose or hairy.

G. Leaves sessile or subsessile.

Medinilla arfakensis Bak. f. in Gibbs, Phyt. & Fl. Arfak Mts. 158. 1917.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, Brass 12395, January 1939, alt. 1500 m., rain-forest (epiphytic shrub 1.5 m. high; panicle red; flowers white). **NORTHEASTERN NEW GUINEA:** Kani Mountains, Schlechter 17037 (isotype of *M. Brassii* Markgr.), December 1907, alt. 1000 m.

BRITISH NEW GUINEA: Bella Vista, Brass 5478, November 1933, alt. 1450 m., oak forest fringe (shrub 1.5 m. high; flowers pale pink).

These collections appear to suit the description of *Medinilla arfakensis* Bak. f. reasonably well. All have sessile leaves, small 5-merous flowers, and anthers with a posticus upwardly recurved spur. We have examined exact duplicates of Schlechter 17037 (the type-number of *M. Brassii* Markgr.) in the herbarium of the New York Botanical Garden and in our own herbarium, and also the single specimen of Brass 5114 cited in the original description. It would seem that Markgraf used the latter collection for most of his description of *M. Brassii*, but, wishing to retain the type at Berlin, designated Schlechter's specimen as the type. The two collections do not belong to the same species. Unfortunately the specific name must go with the type designated, rather than with the collection to which it more logically belongs.

Medinilla Lorentziana Mansf. Nov. Guin. Bot. 14: 206. 1924, Bot. Jahrb. 60: 128. 1925.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction of Black River, Brass 6934, 7300 (det. Markgr.), July 1936, alt. 100 m., epiphytic in ridge forests, fairly common (large loosely branched shrub; bark suberose, deeply furrowed; leaves concave, recurved, pale underneath; panicles terminal, conspicuous; peduncle and pedicels red; flowers pale waxy pink).

Type from Netherlands New Guinea, with a variety occurring also in Northeastern New Guinea.

Medinilla leucantha sp. nov.

Frutex epiphyticus; ramulis valde compresso-tetragonis, quadrialatis (alis approximatis), nodis dense setosis; foliis oppositis similibus sessilibus, basi pulvino persistente reflexo circumdatis, lamina anguste elliptica, 18–40 cm. longa, 8–13.5 cm. lata, utrinque angustata, basi subcordata, apice acuminate, acumine 1 cm. longo, novella subtus in costa, nervis ac acumine minute furfuracea, cito glabrata, 9–13-plinervia, nervis supra manifestis subtus perspicuis; inflorescentiis terminalibus vel axillaribus paniculatis 6–12 cm. longis fere glabris, interdum parce furfuraceis, minute pustulatis; pedunculo communi 2–5 cm. longo, ramis 1–1.5 cm. longis, saepissime quaternis, in verticillos 3–5 dispositis; bracteis minutis; pedicellis ± 5 mm. longis; calycis tubo cupuliformi 3 mm. longo, limbo 2 mm. longo truncato; petalis 5 oblanceolatis, circiter 7 mm. longis; staminibus 10, antheris 3 mm. longis, antice appendices duas subulatas gerentibus, postice calcaratis, calcare uncinato gracili 1 mm. longo; fructibus subglobosis ± 6 mm. diametro.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, Brass 13770 (TYPE), April 1939, alt. 60 m., rain-forest (large epiphytic shrub with greenish white flowers and red fruit); 4 km. southwest of Bernhard Camp, Idenburg River, Brass 13288, March 1939, alt. 850 m., frequent epiphyte on low trees along river, and high on trees of forest (flowers translucent white); Dalman, 45 miles from Nabire, *Kanehira & Hatusima* 12261, March 1940, alt. 500 m., in *Agathis* forest (epiphyte 1 m. tall; flower white).

The leaves of *Medinilla leucantha* closely resemble those of *M. Teysmannii* Miq., according to the original description of the latter species, but the first may be readily distinguished by the much shorter inflorescence, the

considerably smaller white flowers, and the anticus subulate appendages of the anthers.

G. Leaves petiolate.

Medinilla albida sp. nov.

Frutex 1–2.5 m. altus; ramulis tetragonis vel subteretibus interdum angustissime alatis, novellis subplumulosi-pilosis cito glabratim, maturis cinereis, nodis dense setosis; foliis chartaceis oppositis in quoque pari aequalibus vel subaequalibus; petiolo 7–12 mm. longo, novello piloso cito glabratim, basi pulvino angusto persistente reflexo circumdato; lamina oblongo-lanceolata vel lanceolato-elliptica, 9–23 cm. longa, 4–9 cm. lata, basi late cuneata, apice breviter acuminata, acumine 0.5–1 cm. longo, supra minute furfuracea vel glabra, subtus minute furfuracea et nervis pilosa, 7-plinervia, nervis supra manifestis subtus perspicuis; inflorescentiis terminalibus ± 7.5 cm. longis, paniculatis, axi pedicellisque ± furfuraceis, nodis inferioribus setosis; bracteis minutis; pedicellis ± 4 mm. longis; calyce 3 mm. longo, tubo cyathiformi, limbo truncato; petalis 5, obovato-ellipticis, 7 mm. longis; staminibus 10, antheris 2.5 mm. longis, antice inappendiculatis, postice calcaratis, calcare leviter uncinato, 0.7 mm. longo; stylo 4.5 mm. longo; fructibus subglobosis ± 6 mm. diametro.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, Brass 12944, 12993 (TYPE), February 1939, alt. 1200 m. and 1050 m., banks of rainforest stream (shrub 1–2.5 m. high; flowers white; fruiting panicle wholly red).

The species suggests *Medinilla plumosa* Mansf., but the latter has definitely sessile leaves. Then again there is some resemblance between this and the description of *M. schraderbergensis* Mansf., but the pubescence of the latter is of simple hairs.

Medinilla Mansfeldiana sp. nov.

Verisimiliter arbor parva; ramulis dense hirsuto-setosis; nodis longe barbatis; foliis ellipticis, 10–20 cm. longis, 4.5–10 cm. latis, utrinque paullo angustatis, basi obtusiusculis, apice breviter acuminatis, 5-nerviis vel subquintuplinerviis, supra glabris, subtus praecipue costa nervisque parce setosis, venis obscuris; petiolo 1–1.5 cm. longo, parce setoso; inflorescentiis e nodis ramorum vetustiorum orientibus, paniculatis, ± 6 cm. longis; pedunculo 5 mm. longo, axi et ramulis consperse hirsutis, nodis barbellatis; bracteis 1–1.5 cm. longis, oblanceolato-ellipticis, subtus parce hirsutis; pedicellis brevibus, 2–5 mm. longis, dense setulosis; calyce cyathiformi, 4–5 mm. longo, longe setuloso; petalis non visis; staminibus 10, filamentis 3.5 mm. longis, antheris 4 mm. longis postice vix calcaratis breviter obtusis, antice breviter biauriculatis; stylo 9 mm. longo; fructibus subglobosis.

NORTHEASTERN NEW GUINEA: Goridjoa, Schlechter 19744 (TYPE), June 1909, alt. 1200 m., mountain woods.

The species apparently is closely related to *Medinilla sogeriensis* Bak. f. and *M. Schlechteri* Mansf. It may be distinguished from the first by the larger inflorescence on the older branches, and from the second by the petiolate 5-nerved leaves. *M. Schlechteri* Mansf. has 7–9-plinerved leaves.

Medinilla Markgraffii sp. nov.

Medinilla Brassii Markgr. Brittonia 2: 142. 1936, quoad Brass 5114, excl. spec. typ.

Frutex interdum scandens 1–2 m. altus; ramulis cinereis vel fuscescenti-

bus obtuse angulatis vel novellis valde compressis glabris nodosis, nodis setosis; foliis subcoriaccis glabris oppositis ellipticis vel oblongo-ellipticis, 12–22 cm. longis, 4–10 cm. latis, basi cuneatis vel obtuse cuneatis, apice breviter acuminatis vel acutis, 5–7-plinerviis, venis subtransversis supra interdum manifestis subtus obscuris; petiolo ± 1.5 cm. longo, basi pulvino angusto persistente reflexo circumdato; stipulis interpetiolaribus setas ad nodos tegentibus; inflorescentiis paniculatis ± 10 cm. longis, axillaribus vel terminalibus, bracteatis, ad nodos ± setulosis; bracteis inferioribus ± 1.5 cm. longis sursum minoribus, subtus apicem versus interdum ± pubescentibus vel glabris, rubescensibus; pedicellis rubescensibus; floribus tetrapteris; calyce 2.5–3 mm. longo, novello consperse crispe pilosulo, maturo glabro vel subfurfuraceo, truncato; petalis ± 5 mm. longis, albis; staminibus 8, antheris linear-oblongis, 2.5–3 mm. longis, apice paullo angustatis, postice calcaratis, calcare brevi obtuso non recurvo; stylo glabro; fructibus globosis ± 5 mm. diametro.

BRITISH NEW GUINEA: Mount Tafa, *Brass 4018* (TYPE in herb. New York Bot. Gard., isotype in herb. A. A.), May 1933, alt. 2310 m., common on edge of rest house clearing (weak scandent shrub 1–2 m. tall; upper side of leaves iridescent green, the lower side pale; flowers white; pedicels reddish, unripe fruit dark green); same locality, *Brass 5114*, September 1933, alt. 2400 m., in a landslip shrubbery, rare (shrub 1 m. high; peduncle red; petals white; fruit green).

These two collections belong to a single species, which, according to Mansfeld's key for *Medinilla*, falls near *M. warica* Mansf., and, according to that of Baker f., near *M. rubiginosa* Cogn. However, *M. Markgraffii* differs from both of these in pubescence, but we cannot suggest a closer affinity at present. *Brass 5114* appears to have been used largely in the description of *M. Brassii* Markgr.; unfortunately it is not conspecific with the type designated for that species.

Medinilla rubiginosa Cogn. Monog. Phan. 7: 598. 1891; Mansf. Bot. Jahrb. 60: 128. 1925.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass 10786, 10870*, October 1938, alt. 2750 m. and 2650 m., common in moist open spots of forest undergrowth (tree 2.5–3 m. high; panicle red; flowers white); Bele River, 18 km. northeast of Lake Habbema, *Brass 11535*, November 1938, alt. 2200 m., abundant in brushy second growths (shrub or tree 2–4 m. high; panicles red; flowers white; fruit green); Angi, Arfak Mountains, *Kanehira & Hatusima 13609, 13767, 13926*, April 1940, alt. 1900 m.

Previously known only from the type-collection.

A. Leaves opposite; each pair dimorphic (exceedingly unequal in size and unlike in shape), except in *M. tulagiensis*; inflorescence with both bracts and bracteoles.

The remaining species of *Medinilla* in this treatment are all from the Solomon Islands; as stated in our introduction, they belong to a section with a geographic range from the Philippines to western Polynesia. No representatives of this section have thus far been reported from New Guinea.

KEY TO THE SOLOMON ISLANDS SPECIES WITH BRACTEOLATE FLOWERS

Inflorescence open, usually racemose; calyx-limb truncate.

Leaves of each pair somewhat unequal in size, otherwise similar *M. tulagiensis*.

Leaves of each pair exceedingly unequal in size, the smaller usually ovate or ovate-orbicular and sessile or subsessile.
 Larger leaf of each pair sessile or subsessile.
 Branchlets and inflorescence glabrous; larger leaf of each pair \pm 25 cm. long....
 *M. Kajewskii*.
 Branchlets and inflorescence pilose; larger leaf of each pair 6.5–13 cm. long....
 *M. luraluensis*.
 Larger leaf of each pair obviously petiolate.
 Plant apparently glabrous; inflorescence 10–17 cm. long..... *M. anisophylla*.
 At least the nodes and the calyces pubescent; inflorescence smaller, up to 10 cm. long.
 Floral bracteoles large, 1.5–2.3 cm. long.
 Bracteoles pink; leaves with a long narrow acumen, almost glabrous beneath when mature..... *M. calliantha*.
 Bracteoles dirty cream-color or greenish white; leaves short-acuminate, pubescence \pm persisting on the lower surface.
 Leaves elliptic or lance-elliptic, rounded at base; floral bracteoles 1.5 cm. long..... *M. pubiflora*.
 Leaves ovate-elliptic, cordate at base; floral bracteoles 2–2.3 cm. long....
 *M. vagans*.
 Floral bracteoles small, 5–6 mm. long.
 Larger leaf of each pair lanceolate; inflorescence 1.5 cm. long; plant very sparsely pubescent..... *M. lancifolia*.
 Larger leaf of each pair lance-elliptic; inflorescence \pm 10 cm. long; branchlets, lower surface of leaves, and inflorescence obviously pubescent....
 *M. rubescens*.
 Inflorescence capitate (very compact); calyx-limb 4-lobed.
 Larger leaf of each pair petiolate; flowers large, the calyx 1.5 cm. long.....
 *M. cephalantha*.
 Larger leaf of each pair sessile or subsessile; flowers smaller, the calyx 7 mm. long...
 *M. sessilis*.

Medinilla tulagiensis sp. nov.

Frutex scandens; ramulis novellis brunnescentibus barbellato-pilosus, vetustioribus cinereis glabris; nodis barbellatis demum glabratiss; foliis chartaceis ellipticis in quoque pari paullo disparibus: majoribus 12–14 cm. longis, 5–6 cm. latis, basi rotundatis, apice acutis, glabris vel novellis subtus conperse pilosis, quintuplinerviis, venis utrinque interdum manifestis; petiolo 2–2.5 cm. longo; foliis minoribus 3.5–8 cm. longis, 2.5–3.7 cm. latis, petiolo 0.5–1.5 cm. longo, caeterum ut majoribus; inflorescentiis axillaribus racemosis solitariis vel interdum duobus in axillis, \pm 13 cm. longis; axi pedicellisque novellis subplumuloso-pilosulis deinde glabratiss; bracteis oblanceolatis, \pm 1 cm. longis; pedicellis \pm 1 cm. longis; bracteolis 1–1.3 cm. longis, ellipticis, basi elongato-cuneatis, parce pubescentibus; floribus 4-meris; calyce 4 mm. longo, minute subplumuloso-piloso, limbo minute 4-dentato; petalis in alabastro 5 mm. longis; staminibus 8, antheris 4 mm. longis, postice calcaratis antice inappendiculatis; ovario 4-loculato; fructibus subglobosis \pm 7 mm. diametro.

SOLOMON ISLANDS: Tulagi: Brass 3521 (TYPE), January 1933, alt. 50 m., rain-forests, common (showy climber with pale rather fleshy leaves; bracteoles white; petals pink; fruit white).

Medinilla Kajewskii sp. nov.

Frutex scandens; ramulis teretibus glabris nodis barbellatis demum glabris; foliis sessilibus vel subsessilibus glabris chartaceis valde disparibus: majoribus ellipticis, \pm 25 cm. longis, 11–12 cm. latis, utrinque paullo

angustatis, basi rotundatis vel subcordatis, apice acutis vel breviter acuminatis, subseptuplinerviis, venis subtransversis supra inconspicuis subtus manifestis; minoribus late orbicularibus \pm 4 cm. longis et 5 cm. latis, apice rotundatis, mucronatis, quintuplinerviis; inflorescentiis axillaribus brevibus; bracteis obovatis obtusis, 6 mm. longis, 5 mm. latis; pedicellis \pm 1 cm. longis; bracteolis ut bracteis; fructibus subglobosis, 7 mm. diametro; seminibus semiconicis, complanatis, apice rotundatis, vix 1 mm. longis, 0.6–0.8 mm. latis.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, *Kajewski* 1633 (TYPE), August 1930, alt. 900 m. (common climber ascending 4 m.; bracts white; pedicels and petals purple).

This species is readily recognizable by its strongly unequal and sessile leaves, its short open inflorescence, and its rather large somewhat hood-shaped seeds.

Medinilla luraluensis sp. nov.

Frutex scandens; ramulis teretibus nodosis glabratis, novellis pilosis, pilis crassis subplumulosis, nodis novellis barbellatis demum glabris; foliis subcoriaceis valde disparibus: majoribus subsessilibus vel breviter petiolatis (petiolo 3–5 mm. longo), 6.5–13 cm. longis, 2.5–6 cm. latis, basi cordatis paullo inaequalibus, apice acutis vel breviter acuminatis, supra glabris, subtus basim versus costa pubescentibus, quintuplinerviis; minoribus sessilibus subrotundatis vel ovatis, \pm 2 cm. longis et 2.5 cm. latis, cordatis, obtusiusculis, supra glabris subtus nervis \pm pilosis; inflorescentiis axillaribus \pm 10 cm. longis; axi pedicellisque parce pilosulis; bracteis ovato-orbicularibus basi breviter cuneatis, 8 mm. longis, 6 mm. latis, subtus conperse pilosulis; pedicellis 1–1.3 cm. longis; bracteolis ut bracteis; calyce in alabastro pilosulo, 2.5 mm. longo; petalis 3.5 mm. longis; staminibus 8, antheris postice calcaratis; ovario 4-loculato; fructibus subglobosis 5 mm. diametro.

SOLOMON ISLANDS: Bougainville: Lake Luralu, *Kajewski* 2061 (TYPE), August 1930, alt. 1500 m., rain-forest, common (climbing shrub or vine; leaves with purple veins on lower surface; bracts showy pink; fruit white with minute teeth on calyx-tube).

The bracts and bracteoles of this species are smaller than in most of the group of species with dimorphic leaves.

Medinilla anisophylla sp. nov.

Frutex scandens glaber; ramulis cinerascentibus teretibus nodosis; foliis chartaceis, valde disparibus: majoribus 12–16 cm. longis, 4.5–8.5 cm. latis, basi emarginatis vel rotundatis, apice acuminatis, acumine \pm 1.5 cm. longo, quintuplinerviis vel subseptuplinerviis, venis vix manifestis; petiolo 2–3.5 cm. longo; minoribus ovatis, \pm 2 cm. longis latisque, basi subcordatis, apice acutis, subsessilibus vel brevissime petiolatis; inflorescentiis axillariibus racemosis, 10–17 cm. longis, bracteis \pm 1 cm. longis, lanceolatis; pedicellis \pm 1 cm. longis; bracteolis obovato-orbicularibus circiter 1.5 cm. diametro; calycis limbo 4-denticulato; antheris (tantum uno viso) 3.5 mm. longo, postice crasse calcaratis, antice biappendiculatis; fructibus 5–7 mm. diametro.

SOLOMON ISLANDS: San Cristobal: Puepu River, *Brass* 2793 (TYPE), September 1932, alt. 50 m., riverine rain-forest, common (profusely flowering loosely

branched shrub, scandent; leaves fleshy, pale green; each flower between two large fleshy greenish white persistent bracts; corolla pink; filaments purple and red).

Medinilla calliantha sp. nov.

Frutex scandens; ramulis novellis dense et grosse patent-pilosus, pilis basi sub lente subplumulosis, cito glabratis teretibus nodosis, nodis dense setulosis; foliis valde disparibus: majoribus chartaceis ellipticis, 13–20 cm. longis, 6.5–12 cm. latis, basi rotundatis vel obtusis, apice obtusis deinde abrupte acuminatis, acumine 1.5–2 cm. longo sublineari, novellis dense patent-pilosus cito glabratis, maturis utrinque glabris vel subtus costa nervisque parce pilosis, 5–7-plinerviis; petiolo ± 1 cm. longo, glabro; minoribus ovatis, 4.5 cm. longis, 3 cm. latis, sessilibus caeterum ut majoribus; inflorescentiis racemosis paucifloris verisimiliter terminalibus vel axillaribus, 5–7 cm. longis; bracteis 7 mm. longis, 4 mm. latis, oblongo-spathulatis, roseis; axi pedicellisque dense et grosse patent-pilosus; pedicellis circiter 1 cm. longis, floribus 4-meris decussatim oppositis; bracteolis ovato-orbicularibus, circiter 2 cm. longis latisque, basi rotundatis, apice obtusiusculis, utrinque consperse subplumuloso-pubescentibus vel interdum conspersissime pilosis; calyx cyathiformi, ± 5 mm. longo, dense piloso; petalis 1 cm. longis, 6 mm. latis, ellipticis; antheris 6 mm. longis, postice 1.5 mm. calcaratis, antice minute biappendiculatis; stylo ± 8 mm. longo, apice angustato; stigmate minuto.

SOLOMON ISLANDS: Y s a b e l : Tiratona, Brass 3220 (TYPE), 3328, 3540, November and December 1932, alt. 600 m., mountain forests, common (large stiffly branched climber; bark corky, furrowed, thick; young parts covered with brown hairs; fruit in 3220 yellow, in 3328 white).

Medinilla calliantha var. **bella** var. nov.

A forma typica differt ramulis novellis parce subplumuloso-pilosulis; foliis glabris; inflorescentiis ± pilosulis.

SOLOMON ISLANDS: Bougainville: Without field label, Kajewski 1746A; Guadalcanal: Uulolo, Tutuve Mountain, Kajewski 2504 (TYPE of var.), April 1933, alt. 1200 m., rain-forest, common (climbing shrub, very showy; veins of leaves pink; flowers pink).

This variety closely resembles the species but is much more nearly glabrous, with slightly smaller flowers and fruit; the leaves tend to be narrower, the innermost pair of nerves arising from the midrib 2.5 cm. above the base, whereas in *M. calliantha* they are not more than 2 cm. above the base.

Medinilla pubiflora sp. nov.

Frutex scandens; ramulis teretibus nodosis cinereis, novellis brunneis dense piloso-hirsutis, pilis sub lente subplumulosis, deinde glabratis; foliis valde disparibus: majoribus chartaceis ellipticis vel lanceolato-ellipticis, 14–17(–27) cm. longis, 7.5(–12.5) cm. latis, basi rotundatis interdum leviter inaequalibus, apice acutis vel breviter acuminatis, supra conspersissime subtus (costa nervisque ± dense) brunneo-pilosus, 5–7-plinerviis, nervis supra manifestis, subtus prominulis, venis subtus manifeste clathratis; petiolo 1–1.5 cm. longo, dense piloso; minoribus sessilibus vel subsessilibus late ovato-orbicularibus, 2.5(–4) cm. longis, 2.5(–3) cm. latis, 5-nerviis, basi cordatis, apice obtusis apiculatis; inflorescentiis axillaribus, racemosis, ± 4 cm. longis; axi dense, bracteis et bracteolis utrinque pilosis; bracteis vix 1 cm. longis, cuneatis interdum foliiformibus; pedicellis

cellis 4 mm. longis; bracteolis ovatis, 1.5 cm. longis latisque; floribus tantum in alabastro visis; calyce 5 mm. longo, dense piloso, tubo cyathiformi, limbo truncato; petalis 4; staminibus 8, antheris postice longiuscule crasse calcaratis, antice non visis.

SOLOMON ISLANDS: Bougainville: Koniguru, Buin, Kajewski 2153 (TYPE), August 1930, alt. 900 m., rain-forest, common (vine or semi-scandent shrub; flowers dirty cream-color, covered with fine hairs); Kugumaru, Buin, Kajewski 1958, July 1930, alt. 150 m., rain-forest, common (scandent shrub; bracts dirty cream-color; petals light purple); Kieta, Kajewski 1564, March 1930, alt. 100 m., in gullies in rain-forest, common (shrub up to 2 m. high; bracts white, covered with brown hair, giving them a dirty appearance; petals pink-blue; anthers dark blue).

In general habit, *Medinilla pubiflora* calls to mind *M. vagans*, but the pubescence is more evenly distributed and denser, the base of the leaf is rounded rather than cordate, the inflorescence is shorter, and the bracteoles are smaller than in the latter species.

***Medinilla vagans* sp. nov.**

Frutex vagans; ramulis teretibus, novellis obtuse angulatis sulcatis, parce patenti-pilosis, cito glabratis, nodis barbatis; foliis valde disparibus: majoribus ovato-ellipticis usque 11 cm. longis, 5.5–8 cm. latis, basi cordatis, apice abrupte breviter acuminatis, acumine 5–10 mm. longo, supra glabris vel basim versus costa nervisque ± pilosis vel stellato-pubescentibus, subtus praecipue costa nervisque pilosis, 7-plinerviis, nervis prominulis, venis distincte subclathratis; petiolo ± 2 cm. longo, subtus glabratu supra patenti-piloso; minoribus 3 cm. longis, 2.5 cm. latis, subsessilibus vel breviter petiolatis, caeterum ut majoribus; inflorescentiis cymosis axillaribus, circiter 5 cm. longis, paucifloris (verisimiliter 2), pedunculo ad 1 cm. supra basim bibracteato, bracteis caeterum 4 basi pedicellorum, subovato-orbiculatis, ± 7 mm. longis latisque basi interdum anguste cuneatis, utrinque pilosis vel subplumuloso-pubescentibus; bracteolis ovato-ellipticis, 2–2.3 cm. longis, 1–1.5 cm. latis, utrinque pilosis et subplumuloso-pubescentibus; calyce circiter 5 mm. longo, campanulato, dense subplumuloso-piloso; petalis 4, subobovatis, 10 mm. longis, 7 mm. latis, apice emarginatis; staminibus 9 (in duabus floribus dissectis), antheris (in alabastro) 4 mm. longis, postice obtuse breviter calcaratis, calcare verruculoso, crasso, antice biauriculatis; stylo 5 mm. longo.

SOLOMON ISLANDS: Ysabel: Tataba, Brass 3438 (TYPE), January 1933, alt. 50 m., amongst regrowth trees on a rain-forest clearing (large rambling shrub; leaves dull; bracteoles white; petals and filaments pale pink; anthers blue; fruit greenish white; a very showy plant, with brown indument).

This species is fairly easy to recognize by the ovate-elliptic cordate leaves in unequal pairs and the pubescent cymose (subracemose) inflorescence with rather large white bracts.

***Medinilla lancifolia* sp. nov.**

Frutex scandens; ramulis subteretibus cinereis nodosis glabris, nodis minute stellato-pubescentibus deinde glabratis; foliis valde disparibus: majoribus chartaceis lanceolatis, 4–9 cm. longis, 1–3 cm. latis, utrinque angustatis, basi cuneatis, apice obtuse acuminatis, novellis consperse stellato-pubescentibus cito glabratis, vel consperse minute papillatis, triplinerviis vel interdum subquintuplinerviis; petiolo usque 5 mm. longo glabro; minoribus sessilibus ovatis usque 1.7 cm. longis, 1 cm. latis; inflorescentiis

axillaribus, \pm 1.5 cm. longis, racemosis, novellis consperse stellato-pubescentibus; bracteis albido-viridescentibus, usque 6 mm. longis et 3 mm. latis, subcuneiformibus, consperse minute pubescentibus; pedicellis 2 mm. longis; bracteolis ut bracteis; calyce minute pubescente, tubo cyathiformi, \pm 3 mm. longo, limbo vix 2 mm. longo; petalis 4, obovatis, 6 mm. longis, apice abrupte acutis; staminibus 8, antheris 4 mm. longis; stylo \pm 7 mm. longo, apice angustato; stigmate minuto.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, Kajewski 1699 (TYPE), April 1930, alt. 950 m., growing from crevices in tall rain-forest trees (petals mauve; anthers blue; bracts cream-green).

In the short bracteate inflorescence the species somewhat suggests *Medinilla involucrata* Merr., but it is amply distinct from that species in the size and venation of the leaves as well as in the lack of pubescence.

Medinilla rubescens sp. nov.

Frutex scandens; ramulis novellis dense subplumoso-pilosus deinde glabratris nodosis; foliis valde disparibus: majoribus chartaceis lanceolato-ellipticis, 9–14 cm. longis, 3.5–6 cm. latis, basi rotundatis vel emarginatis, apice acutis vel breviter acuminate, supra costa nervisque praecipue ad basim pilosis, subtus (costa nervisque dense) ferrugineo-pilosus, 5–7-plinerviis, nervis prominulis, venis \pm distinctis; petiolo circiter 2 cm. longo, dense pilosulo; minoribus sessilibus vel breviter petiolatis (petiolis 2–3 mm. longis), ovatis, 1.5–3 cm. longis, 1–2 cm. latis, 5-plinerviis caeterum ut majoribus; inflorescentiis axillaribus, paniculatis vel cymosis, 5–10 cm. longis, ramis paucis racemiformibus; axi pedicellisque pilosulus vel pubescentibus; nodis bracteatis; bracteis oblanceolatis basi cuneatis, 5 mm. longis, 2 mm. latis, glabratris; bracteolis late ovatis obtusis, circiter 5 mm. longis et 4 mm. latis, stellato-pubescentibus; calyce 2 mm. longo, cyathiformi, dense pubescente; petalis 4, ellipticis, obtusis, 4–5 mm. longis; staminibus 8, antheris 3 mm. longis, antice biauriculatis, postice breviter calcaratis, calcare crasso verruculoso; fructibus subglobosis, \pm 5 mm. longis.

SOLOMON ISLANDS: Guadalcanal: Uulolo, Tutuve Mountain, Kajewski 2514 (TYPE), April 1931, alt. 1200 m., rain-forest, common (scandent shrub; flowers and bracts pink; small green fruit 6 mm. diameter).

Medinilla cephalantha sp. nov.

Frutex scandens; ramulis teretibus, novellis dense hirsutis cito glabratris, brunneis deinde cinereis nodosis, nodis setosis; foliis valde disparibus: majoribus chartaceis ellipticis vel late ellipticis usque 25 cm. longis et 15 cm. latis, basi rotundatis vel obtusis, apice obtusis subinde abrupte acuminate, novellis dense hirsutis, maturis glabris, 7-plinerviis, nervis saepe ad 1–2 cm. inter se distantibus, utrinque perspicuis, venis oblique transversis manifestis; petiolo 1.5–2.5 cm. longo, hirsuto; minoribus sessilibus vel subsessilibus, ovato-orbicularibus, 3 cm. longis, 2.5 cm. latis, basi cordatis, apice rotundatis subinde brevissime acuminate; inflorescentiis sessilibus e ramulis vetustis defoliatis orientibus vel interdum axillaribus, capitatis, interdum oppositis, 2.5–6.5 cm. longis, dense multifloris; floribus subsessilibus vel breviter pedicellatis, pedicello \pm 4 mm. longo, hirsuto; bracteis ut bracteolis, 1.5–1.7 cm. longis, late lanceolatis vel ellipticis, apice obtusis, basi sensim anguste cuneatis, subtus hirsutis; calyce 1.5 cm. longo, dense hirsuto, limbo 4-lobato vel 4-fido, intus piloso, lobis rotundatis retusis,

petalis in alabastro tantum visis glabris; staminibus 8 aequalibus, antheris sub anthesi 6 mm. longis apice poro aperientibus, postice obtuse inconspicue calcaratis (calcare 0.5 mm. longo, crasso), antice biauriculato, auriculis minute verruculosis; stylo \pm 1.5 cm. longo.

SOLomon ISLANDS: Ysabel: Kakatio, Brass 3255 (TYPE), December 1932, alt. 900 m., common in rain-forests (large scandent shrub; bracteoles pink; flowers white); Guadacanal: Sorvorhio Basin, Kajewski 2705, January 1932, alt. 300 m., in wet gullies of rain-forest, common (small tree or large shrub; inflorescence pink); San Cristobal: Hinuahoro, Brass 3022, September 1932, alt. 900 m., mountain rain-forests, common (scandent shrub with long drooping branches; flower pink).

On account of the variability within the genus *Medinilla* Gaudichaud, we are now inclined to believe that the Philippine *Cephalomedinilla* Merr. is probably best considered as a section of *Medinilla*. This species and *M. sessilis* from the Solomon Islands clearly belong to the same section, but both may be readily distinguished from the Philippine species by the stronger dimorphism of the pairs of opposite leaves, the smaller of these being ovate-orbicular rather than similar in shape to the larger ones.

Medinilla sessilis sp. nov.

Frutex scandens; ramulis teretibus \pm hirsutis cito glabratis, nodis dense barbatis; foliis valde disparibus, sessilibus vel subsessilibus, basi pulvino persistente reflexo circumdati: majoribus ellipticis utrinque angustatis, basi subcordatis, apice acuminatis, acumine \pm 1 cm. longo, supra glabris, subtus costa nervisque (novellis dense) consperse pilosis, 5–7-plinerviis, nervis inter se \pm 1 cm. distantibus, venis clathratis subtus prominulis; minoribus suborbicularibus vel ovato-orbicularibus fere semiamplexicaulibus, 1–1.5 cm. longis, circiter 2 cm. latis; inflorescentiis capitatis, \pm 2 cm. diametro, axillaribus sessilibus; floribus subsessilibus; bracteis ut bracteolis, \pm 1 cm. longis, late orbicularibus, basi anguste cuneatis, apice retusis vel truncatis, utrinque parce hirsutis; calyce 7 mm. longo, hirsuto, tubo obconico, limbo 3–4 mm. longo, 4-lobato, intus hirtello; petalis 4; staminibus 8, antheris postice calcaratis, antice verisimiliter appendiculatis (staminibus immaturis, appendicibus non visis); ovario apice piloso.

SOLomon ISLANDS: Bougainville: Koniguru, Buin, Kajewski 2023 (TYPE), August 1930, alt. 850 m., rain-forest, common (scandent; bracts purple).

This species is readily distinguished from *Medinilla cephalantha* Merr. & Perry by the sessile or subsessile larger leaf of each pair; also, the reflexed narrow base surrounding the leaf-attachment is much more obvious here than in the other species.

Astronia Blume

Astronia papetaria Bl. Rumphia 1: 20. t. 6. 1835, var. **novo-guineensis** var. nov.

A forma typica differt foliis minoribus, 8–15 cm. longis, 1.5–4 cm. latis, in quoque pari vix aequalibus; petiolo 1.5–2 cm. longo ad ramuli insertionem non calloso-verrucoso; calycis lobis brevioribus, late triangularibus, acutiusculis.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, Brass 13292, 13454 (TYPE of var.), Mar. 1939, alt. 900 m., frequent in *Agathis* forest undergrowth, and occasional in rain-forest of ridges (tree 3–4 m. high; leaves brown beneath; flowers pink); 2 km. southwest of Bernhard Camp, Idenburg River, Brass 13671, March 1939, alt. 750 m., common in rain-forest of slopes (tree 5–6 m. high; leaves brown underneath; flowers pink).

The collections cited above show a strong similarity to Blume's plate of *Astronia papetaria* from the Moluccas, but differ as indicated above.

***Astronia atro-viridis* Mansf. Bot. Jahrb. **60**: 131. 1925.**

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass & Versteegh 10466*, October 1938, alt. 2750 m., frequent in primary forest; Bele River, 18 km. northeast of Lake Habbema, *Brass & Versteegh 11151*, November 1938, alt. 2300 m., frequent substage tree of primary forest; 15 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 11919, 11937*, January 1939, alt. 1780 m. and 1630 m., occasional in mossy forest, frequent in rain-forest (tree 20–28 m. high with black scaly bark; flowers white; fruit yellow-green). BRITISH NEW GUINEA: Mount Tafa, *Brass 4953*.

In these collections the leaves vary greatly in size from those of the original material, in some cases being as small as 4 × 2 cm.; again, occasionally the leaves are almost densely lepidote, and only slightly, if at all, furfuraceous, but the characters are too inconstant to be of value. At the apex for a very short distance the margins are rolled to meet, causing the apex to appear almost like an appendage attached to the rest of the leaf by a constriction.

***Astronidium* A. Gray**

***Astronidium nigrescens* (Mansf.) Markgr. Notizbl. Bot. Gart. Berl. **12**: 48, 49. 1934.
Everettia nigrescens Mansf. Bot. Jahrb. **60**: 136. 1925.**

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass 12091*, January 1939, alt. 1800 m., frequent in rather open rain-forest ravines (tree 4–5 m. high; inner surface of petals white, the outer surface pink; stamens and pistil white). Described from Northeastern New Guinea.

***Astronidium novo-guineense* sp. nov.**

Arbor usque 10 m. alta; ramulis teretibus vel infra nodos subangulatis atro-cinereis glabris; foliis subcoriaceis ellipticis vel leviter obovato-ellipticis, basi obtusis vel cuneatis, apice brevissime et obtuse acuminatis vel acutiusculis, supra glabris, subtus praecipue nervis venisque minute furfuraceo-lepidotis, triplinerviis, nervis in laminae parte centrali 1.5–2 cm. a costa dispositis, supra insculptis, subtus perspicuis, venis clathratis, ± 7 mm. remotis, supra inconspicuis subtus prominulis, vena marginali 1–2 mm. intra marginem disposita, reticulo conferto; inflorescentiis terminalibus cymoso-paniculatis, ± 10 cm. longis latisque, glabris, pedicellis 6–7 mm. longis; calyx urceolato, tubo 2.5–3 mm. longo, limbo 1 mm. longo truncato; petalis 5, oblongis, 6 mm. longis; staminibus 10, in alabastro filamentis 4 mm. longis crassiusculis complanatis, antheris ± 5 mm. longis (in alabastro apice reflexis), postice calcaratis, calcare crasso, 1 mm. longo; stylo 5 mm. longo; ovario 4- vel 5-loculato.

NETHERLANDS NEW GUINEA: 18 km. southwest of Bernhard Camp, Idenburg River, *Brass 12695* (TYPE), February 1939, alt. 2150 m., mossy forest, common in gullies (up to 8–10 m. high; flower-buds white); 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13312*, March 1939, alt. 900 m., abundant in *Agathis* forest and more open parts of mossy forest (tree 6–7 m. high).

This species is very close to *Astronidium palauense* (Kaneh.) Markgr. (including *A. carolinense* (Kaneh.) Markgr., which, from a comparison of the isotypes, appears to be the same species). It differs in having an urceolate, not cupular, calyx, and a much closer reticulum in the leaves than is characteristic of the Micronesian material.

Astronidium insulare sp. nov.

Arbor usque 17 m. alta; ramulis teretibus, novellis inter nodos compressis leviter sulcatis et minute lepidotis; foliis oppositis ellipticis, 9–16 cm. longis, 4.5–7.5 cm. latis, basi obtusis subinde cuneatis ± 5 mm. decurrentibus, apice acutis vel breviter acuminatis, apiculatis, supra glabris, subtus minute lepidotis, triplinerviis, nervis in laminae parte centrali 2–2.5 cm. a costa dispositis, supra distinctis, subtus prominulis, venis clathratis ± 1 cm. remotis, supra manifestis subtus prominulis, venulis inconspicuis; petiolo 2–2.5 cm. longo; inflorescentiis immaturis 5 cm. longis, terminalibus, dense lepidotis; pedicellis 2 cm. longis; calyce 4 mm. longo obpyriformi, apice 5-lobato, lobis 0.4 mm. longis, ± 1.5 mm. latis, mucronulatis; ovario 5-loculato.

SOLOMON ISLANDS: Bougainville: Koniguru, Buin, Kajewski 1999 (TYPE), August 1930, alt. 800 m., rain-forest, common (small tree up to 17 m. high; buds green).

The species is perhaps most like the description of **Astronidium novae-hannoverae** (Engl.) comb. nov. (*Astronia novae-hannoverae* Engl. Bot. Jahrb. 7: 468. 1886), from the Bismarck Archipelago. However, the calyx of the flower-buds, although still not approaching anthesis, appears to be about twice as large as that described for the latter species. We have not found any reference to Engler's species either in Mansfeld's "Die Melastomataceen von Papuasien," Bot. Jahrb. I.c., or in Markgraf's "Die Gattung Astronidium A. Gray," Notizbl. Bot. Gart. Berl. 12: 47–50. 1934.

Astronidium montanum sp. nov.

Arbor usque 7–8 m. alta; ramulis tetragonis vix alatis, minute lepidotis; foliis tenuiuer chartaceis, 10–15 cm. longis, 3.5–6 cm. latis, minute pellucido-punctatis, subtus minute papillatis parce minute lepidotis, basi cuneatis, apice obtuse acuminatis, trinerviis, nervis in laminae parte centrali 1–1.5 cm. a costa dispositis, venis marginalibus (2 vel 1) circiter 2–5 mm. intra marginem manifestis, venis clathratis ± 1 cm. remotis; petiolo 2–2.5 cm. longo, gracili; inflorescentiis terminalibus cymoso-paniculatis, ± 8 cm. longis latisque, glabris, ramis gracilibus; pedicellis circiter 7 mm. longis; bracteis non visis; calyce cyathiformi, 5–6 mm. longo, 5 mm. diametro, limbo subirregulariter 4-lobato, petalis 6, oblanceolato-oblongis, 12 mm. longis, apice obtusis; staminibus 12, filamentis complanatis, 9 mm. longis, antheris 7 mm. longis, linearibus, apice reflexis, postice calcaratis, calcare 1 mm. longo; stylo 10 mm. longo; ovario 5- vel 6-loculato.

SOLOMON ISLANDS: Guadalcanal: Uulolo, Tutuve Mountain, Kajewski 2515 (TYPE), January 1931, alt. 1200 m., rain-forest, common (small tree 7–8 m. high; flowers light green).

In habit, *Astronidium montanum* suggests *A. victoriae* (Gillespie) A. C. Sm., of the Fiji Islands, but the leaves of the former are not rounded or obtuse at the base, and the flowers are about twice as large and lack the lepidote character of those of the Fijian species.

Astronidium muscosum sp. nov.

Arbuscula 3 m. alta; nodis perspicue setuloso-pilosus, internodiis, basi setuloso-pilosa excepta, glabris, valde compressis sulcatis; foliis coriaceis late ellipticis vel obovato-ellipticis, 18–29 cm. longis, 10–16 cm. latis, basi rotundatis vel obtusis, apice acutis vel breviter acuminatis, supra glabris

subtus nervis venisque pilosis deinde glabratibus, quintunerviis vel quintuplinerviis (nervo marginali non inclusa), nervis supra insculptis subtus perspicuis, venis oblique transversis subclathratis, supra manifestis subtus prominulis, venulis subtus distinctis; petiolo 4–7 cm. longo, basi (1 cm.) dense piloso caeterum glabrato; inflorescentiis paniculatis terminalibus, 10–12 cm. longis latisque, ramis oppositis ± crispe pilosis; floribus subsessilibus ad ramulorum hirtellorum apicem dense glomeratis bracteatis, bracteis caducis; calyce clavato, 5 mm. longo, tubo 3.5 mm. longo basim versus minute consperse setuloso, lobis 5 obtusiusculis; petalis 5 in alabastris 3+ connatis; staminibus 10, filamentis 3.5 mm. longis complanatis, antheris laesis postice calcaratis, calcare 1.2 mm. longo, obvio reflexo apice expanso; stylo 4 mm. longo.

SOLOMON ISLANDS: San Cristobal: Hinuahaoro, Brass 3035 (TYPE), September 1932, alt. 900 m., mountain rain-forest, rare (large shrub or small tree 3 m. high, with stiff ascending branches). Probably also belonging here is Kajewski 2507 from Uulolo, Tutuve Mountain, Guadalcanal. The specimen has almost glabrous leaves and flower-buds, and the receptacle is densely pilose around the base of the calyx.

In leaf-outline and in contour of the flower-buds, *Astronidium muscosum* suggests *A. Brassii* Markgr. of New Guinea, but the latter has chartaceous triplinerved leaves, a smaller and much more open inflorescence, and lacks the obviously coarsely hairy petiole-bases and nodes which are so characteristic of our species. The specific name is chosen to indicate the last mentioned character.

***Astronidium salomonense* sp. nov.**

Arbor usque 15 m. alta; ramulis novellis valde compressis tetragonis anguste alatis, minute lepidotis; foliis subcoriaceis ellipticis, 8–14 cm. longis, 3.5–7 cm. latis, basi cuneatis, apice abrupte breviter acuminatis, supra glabris vel utrinque minute lepidotis, triplinerviis, nervis in laminae parte centrali 1.5–2.5 a costa remotis, venis subtransversis clathratis utrinque manifestis; petiolo 1.5–2.5 cm. longo; inflorescentiis terminalibus, immaturis, 6–9 cm. longis, 10–14 cm. latis, subcorymboso-paniculatis; axi et ramulis valde compressis tetragonis; pedicellis circiter 1 cm. longis; alabastris tantum visis; calyce ovali, 9 mm. longo, 6–7 mm. diametro, apice irregulariter brevibus fissuris aperiente; petalis 6; staminibus 12; ovario 6-loculato.

SOLOMON ISLANDS: Bougainville: Kieta Gold Field, Kajewski 1703 (TYPE), April 1930, alt. 1000 m., rain-forest, common (small tree up to 15 m. high; flower-buds green).

The general habit of *Astronidium salomonense* is similar to that of *A. aneityense* (Guillaumin) A. C. Sm., of the New Hebrides, but the leaves of the former are more nearly coriaceous and opposite, the flower-buds are larger, and the branchlets are definitely tetragonous.

***Astronidium sessilifolium* sp. nov.**

Arbor usque 10 m. alta, glabra; ramulis novellis valde compressis, leviter sulcatis, parce minute lepidotis; foliis chartaceis sessilibus obovato-ellipticis, 15–25 cm. longis, 5–10 cm. latis, basim versus angustatis, apice obtusiusculis vel forsan acutiusculis, subtus minute granulosis, triplinerviis, nervis a costa supra basim 2.5–6 cm. ortis, in laminae parte centrali 3 cm. a costa

distantibus; venis ascendent-patentibus, circiter 1 cm. remotis, subtus prominulis, nervo marginali 4–7 mm. intra marginem disposito; inflorescentiis terminalibus, circiter 15 cm. longis et 10 cm. latis; axi, ramis ramulisque subangulatis valde compressis, sulcatis; pedicellis 5–8 mm. longis; alabastris globosis, ± 6 mm. diametro, calyce apice vix aperto; fructibus 6- vel 7-loculatis, depresso-globosis, 4–5 mm. altis, 7–8 mm. diametro, apice calycis limbo recto (3 mm. longo) margine leviter 6-lobato coronatis; seminibus 0.8 mm. longis, lineari-angulato-clavatis.

SOLOMON ISLANDS: Bougainville: Siwai, Waterhouse 193 (ser. no. 22983) (TYPE), January 1933, shrub or small tree near water; Koniguru, Buin, Kajewski 2163, August 1930, alt. 900 m., rain-forest, common (small tree up to 10 m. high; the flower-buds have a disagreeable odor when crushed).

This species, in the shape of the leaves and the lack of a petiole, suggests the Fijian *Astronidium sessile* (A. C. Sm.) A. C. Sm., but the main nerves in the latter lie 0.8–1.5 cm. within the margin, whereas in the former they are almost half way between the midrib and the margin; the flowers too are smaller in the Solomon Islands material and the bracts of the young inflorescence are oblong rather than orbicular.

***Astronidium anomalum* sp. nov.**

Arbor parva 6–7 m. alta glabra; ramulis subteretibus brunneis; foliis tenuiter coriaceis lanceolato-ellipticis, 5–8 cm. longis, 1.8–3 cm. latis, utrinque angustatis, basi obtuse cuneatis, apice acutis vel breviter acuminate, margine anguste recurvis, in sicco supra olivaceo-viridescentibus, subtus brunnescentibus, nervis primariis utrinsecus 11–14 late patentibus fere subtransversis, supra subobscuris, subtus manifestis, reticulo subtus vix manifesto, conferto, vena marginali 1–1.5 mm. intra marginem disposita; petiolo 0.8–1.7 cm. longo, gracili, supra canaliculato; inflorescentiis 4.5–7 cm. longis, 4–6 cm. latis, terminalibus cymoso-paniculatis, axi, ramis ramulisque valde compressis, subangulatis; pedicellis 1.5–2 mm. longis; floribus non visis; fructibus minute lepidotis vel glandulosis, depresso-globosis, 2.5 mm. longis, 3 mm. diametro, calycis limbo coronatis (limbo 5-lobato, 0.6–0.8 mm. longo), 3-loculatis; seminibus 0.8 mm. longis, apice 0.2–4 mm. latis, rectis vel leviter curvatis, cuneatis, apice truncatis vel suboblique truncatis, ± angulatis; placantis 3, circiter 1 mm. longis.

SOLOMON ISLANDS: Guadalcanal: Uulolo, Tutuve Mountain, Kajewski 2623 (TYPE), May 1931, alt. 1500 m., rain-forest (small tree up to 6–7 m. high, with gnarled and twisted habit; fruit cream-green, about $\frac{3}{4}$ mature).

Although the fruit is small, in structure it is like that of *Astronidium* A. Gray. The leaves, however, are not triplinerved, as one usually finds in this genus, but have only the midrib obvious; the lateral pinnately arranged nerves are easily seen on the lower surface but are not at all raised.

***Memecylon* Linnaeus**

***Memecylon papuanum* sp. nov.**

Arbor parva circiter 9 m. alta, glabra; ramulis teretibus, novellis interdum inconspicue angulatis brunnescentibus; foliis coriaceis late ellipticis, 12–20 cm. longis, 5.7–11 cm. latis, basi cuneato-obtusis, apice abrupte acuminatis, costa supra impressa, subtus conspicua, venis primariis utrinque subobscuris vel vix manifestis, utrinsecus ± 12; petiolo circiter 5 mm.

longo, crasso; inflorescentiis axillaribus brevissimis, 5–7 mm. longis, bracteis 1–1.5 mm. longis, ovatis acutis; pedicellis 1 mm. longis; alabastris ovoideis, 4 mm. longis, vix 4 mm. latis; calyce obconico, 3 mm. longo, truncato; disco stamina circumdante costato; petalis 4 late ovatis, 2.5 mm. longis, 3 mm. latis, obtusiusculis; staminibus 8; fructibus pedicellatis, late globosis (5 mm. longis, 6 mm. diametro) calycis limbo (vix 1.5 mm. longo) coronatis.

NORTHEASTERN NEW GUINEA: Mountains near Yaduma, Schlechter 19291, April 1909, alt. 300 m. BRITISH NEW GUINEA: Ihu, Vailala River, Brass 977 (TYPE), February 1926, rain-forest (small slender tree 30 feet high, with thick pale leaves).

Memecylon papuanum seems to be most like the descriptions of the Javanese *M. excelsum* Bl. and *M. floribundum* Bl., but these have larger fruits, less dense inflorescence, and longer pediceled flowers.

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FERNS OF THE SECOND ARCHBOLD EXPEDITION TO NEW GUINEA*

E. B. COPELAND

THE ferns of the First Archbold Expedition to New Guinea were discussed by Dr. Carl Christensen, in *Brittonia* **2**: 265–317. 1937. These were from the high mountains of British New Guinea, and, from the 343 numbers collected, Christensen described 40 new species.

The Third Archbold Expedition collected in Netherlands New Guinea, mostly at high altitudes. From an incomparable wealth of more than 900 field numbers, I described 109 species as new. Publication of these began in the Philippine Journal of Science but was interrupted by war. To record and guard the names, I published brief diagnoses of 87 species, still awaiting publication and illustration in Manila, in the University of California Publications in Botany (**18**: 217–226. 1942).

The Second Archbold Expedition collected at low altitudes, although far from the coast, in the plains and foothills far up the Fly River. Such country is poor in ferns as compared with the mountains, and the ferns which do occur in the lowlands are mostly species of wide range. It is therefore not surprising that the 171 collection numbers of this expedition include no more than five definitely new species. Descriptions of these and comment on a few other species follow. All the numbers cited are represented in the Gray Herbarium, and the types of new species, unless otherwise indicated, are deposited in the author's herbarium.

Cephalomanes Ledermannii (Brause) comb. nov.

Trichomanes Ledermannii Brause in Bot. Jahrb. **56**: 35. 1920.

BRITISH NEW GUINEA: Fly River, 528-mile Camp, alt. 80 m., in ridge forests, Brass 6663.

Related to *C. atrovirens* Presl (*Trichomanes rhomboideum* J. Sm.), but distinguished, as correctly indicated by Brause, by smaller size, lax venation, and small, obconic involucres. The sori of our specimen are more abundant than on Brause's type, and therefore they occupy a larger part of the frond and occupy the ends as well as the acrosopic sides of the pinnae; some occur even below the ends, on the basiscopic sides.

Trichomanes maluense Brause is distinguished in part by just such a more ample production of sori. Whether or not its rather feeble other differences are more significant, I do not venture to guess.

Cyclosorus gregarius sp. nov.

C. rhizomate adscendente, sicco 6 mm. crasso, apice paleis fuscis linearilanceolatis glabris debilibus 3–4 mm. longis vestito; stipitibus approximatis, usque ad pinnas reductas 25 cm., ad pinnas normales 70 cm. altis,

*Botanical Results of the Richard Archbold Expeditions.

rhachibusque glabris; fronde, pinnis basalibus remotis abrupte reductis exclusis, fere 60 cm. alta et 25 cm. lata, pinnata, pinna apicali caeteris conforme sed minore; pinnis normalibus remotis, alternantibus, sessilibus, inferioribus fere 15 cm. longis et 15 mm. latis, gradatim acuminatis, basi late cuneatis, leviter crenato-lobatis lobis crenulatis, herbaceis, costa superne setulis inconspicuis inflexis praedita, aliter glabrescentibus, venulis acroscopicis 3, basicopiscis 2 anastomosantibus; soris medialibus vel infra-medialibus, indusio parce et breviter ciliato, caduco.

BRITISH NEW GUINEA: Fly River, 528-mile Camp, alt. 80 m., Brass 6759 (TYPE), "gregarious in clumps over 1 m. high, on mud in shaded creek bottoms."

Indusia can be detected only on the youngest sori.

Lindsaea subtripinnata sp. nov.

L. gregis *L. heterophyllae* Dry. et *L. orbiculatae* (Lam.) Mett., fronde basi tripinnata, apice attenuata pinnata, pinnis medialibus pinnatis lanceolatis, pinnulis omnibus parvis, cuneatis plerisque obovato-cuneiformibus apice rotundatis, venis liberis, soro continuo vel rarius interrupto, indusio cum margine contermino.

BRITISH NEW GUINEA: Tarara, Wassi Kussa River, Western Division, Brass 8491 (TYPE), common on banks of gullies in rain-forest.

The stipe is about 30 cm. and the lamina about 25 cm. long.

Great as is the variety of fronds referred to *L. orbiculata* and *L. heterophylla*, *L. subtripinnata* seems sufficiently distinguished by its small pinnales and the absence of larger undivided pinnae. The free venation is correlated with the fine dissection of the frond. I have no New Guinean specimen of either *L. heterophylla* or *L. orbiculata*, but the former has been reported from the island. The group runs riot in New Caledonia.

Oleandra subdimorpha sp. nov.

Epiphytica, caudice gracili, paleis supra basim peltatis, nigris marginem lacerum versus pallescentibus ad ramos laterales breves imbricatis ad caudices erectos elongatos sparsis; frondibus ad ramos approximatis, ad caudices remotis, pedicellis 4 mm. longis, stipitibus 12–18 mm. longis, frondium fertilium paullo longioribus; fronde sterili ca. 18 cm. longa et 4 cm. lata, basi subinaequaliter rotundata, apice abrupte in caudam angustissimam 3 cm. longam contracta, coriacea, glabra, venis arcte approximatis; fronde fertili longiore, 1 cm. lata, venis remotioribus, soris medialibus, indusiis late reniformibus, oblique insertis, atrocastaneis, coriaceis.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction with Black River, alt. 100 m., Brass 6886 (TYPE, in Gray Herb.), "stiff climbing epiphyte."

A relative of *O. Wernerii* Ros., but less dimorphic, the base of the sterile frond broader, the sori farther from the margin.

Humata papuana sp. nov.

H. gregis *H. repens*, rhizomate gracili late repente, paleis atrofuscis lanceolatis 3 mm. longis tum demum deciduis vestito, deinde glauco; frondibus remotis, dimorphis, sterilium stipitibus plerumque perbrevibus rarius usque ad 5.5 cm. longis, sparse et decidue squamiferis, laminis deltoideis usque ad 5 cm. longis, pinnatis pinnis infimis tantum pinnatifidis sessilibus apice rotundatis coriaceis glabris, segmentis sequentibus lobatis, superiori-

bus integris; frondium fertilium stipitibus 9 cm. altis, gracilibus, laminis 7 cm. longis late deltoideis basi tripinnatifidis, soris et axialibus et ad bases dentium brevium inconspicuorum, indusis quam longis multo latioribus, etenim marginem superantibus.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction with Black River, alt. 100 m., Brass 6987 (TYPE), "matted on branches of tall canopy trees." Brass 6593, Fly River, 528-mile Camp, alt. 80 m., "creeping in moss mats high on canopy trees, common," is a depauperate form of the same species, the sterile fronds at most 2 cm. long, on stipes 7 mm. long.

Related to *H. kinabaluensis*, which has the teeth subtending the sori more completely suppressed, and to *H. pusilloides*, which has them much more conspicuous. *Humata alpina* var. *edentula* Ros. is like *H. kinabaluensis* in suppression of the teeth; judging by a single specimen, the sterile frond is more contracted, but with longer pinnae.

? **Polypodium neglectum** Blume, Enum. Pl. Jav. 121. 1828, Fl. Jav. Fil. 133. pl. 54, f. 1. 1828.

BRITISH NEW GUINEA: Palmer River, alt. 100 m., common on branches of tall trees, Brass 6881.

The identification is by description and doubtful. The rhizome is "repens, filiforme, tenue, ramosum, paleis linear-lanceolatis acutissimis . . . imbricatis albo-scariosis . . . vestitum," quoting, with omissions, Presl, Epim. 124; Presl's description is likely to have been based on a "Manila" plant of Meyen. Van Alderwerelt's description, Malayan Ferns 435, fits Brass' plant in most respects. Backer & Posthumus, Varenflora voor Java 195, reduce *P. neglectum* to *P. stenophyllum* Blume, which seems most unlikely to be correct. Brass' plant is certainly not *P. stenophyllum*.

P. redimiens Brause is also known to me from description only. This description fits Brass' plant as to the fronds, but the rhizome is said to be "pallidum," "auffallend bleich," while that of Brass' plant is partly fuscous, mostly black; and the paleae are said to be "clathratis, deltoideis margine spinuloso-dentato," all of which is inappropriate. However, I suspect its identity with our plant. There is near affinity to *Polypodium pyrolaeifolium* Bergsmann, the type of *Crypsinus*; and, still nearer, to *P. Whitfordii* Copel., of Luzon.

Selliguea Archboldii sp. nov.

S. gregis S. Feei, rhizomate late repente, paleis nigris, basi peltatis fusco-mARGINATIS, deinde in setas squarrosas abrupte contractis; frondibus remotis, sterilibus ca. 15 cm. longis et 35 mm. latis, abrupte caudatis, coriaceis, basi cuneatis, stipitibus 6 cm. longis, venis haud occultis; frondibus fertilibus 10–12 cm. longis et 12–15 mm. latis, basi attenuatis; soris superficialibus, e costa ad marginem protensis.

BRITISH NEW GUINEA: Fly River, 528-mile Camp, alt. 80 m., Brass 6836 (TYPE, in Gray Herb.), "creeping epiphyte, common on branches of high canopy trees; fronds very stiff."

Most like *S. feeioides* Copel., of Fiji, Samoa, and Tahiti, but smaller, with smaller, darker and narrower paleae.

Cyclophorus dispar Christ in Nova Guinea **8**: 155. 1909; v. A. v. R. in Bull. Jard. Bot. Buitenz. II. **1**: 4. pl. 2, f. 2, 3. 1911.

BRITISH NEW GUINEA: Palmer River, alt. 100 m., Brass 6872, 6879, 7253, 7371, epiphytic, mostly on mossy branches of canopy trees; very uniform.

The fronds are short-stipitate rather than subsessile, but the conformity with Christ's description is reasonably close. I find nothing like the lid over the soral cavity, nor the great tufts of hairs described and figured by van Alderwerelt. The indument of the nether surface of the sterile frond is persistent. The sori are in an irregular row, or in two or three hardly distinguishable rows. On fully fruiting fronds, the sori come into contact as they expand.

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NOTES ON THE FLORA OF KWANGSI PROVINCE, CHINA

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KWANGSI Province, in southern China, bordering on Kwangtung to the east, Yunnan to the west, and Tonkin to the south, received comparatively little attention from botanical collectors in the early years of the botanical exploration of China. In recent years, however, extensive and important collections have been assembled from Kwangsi, particularly through the initiative and interest of Prof. W. Y. Chun, Director of the Botanical Institute, Sun Yatsen University, Canton, Dr. F. P. Metcalf of Lingnan University, Canton, and Dr. A. N. Steward of the University of Nanking, Nanking, China. Various expeditions organized by these men, and supported, in part, by grants made from the Arnold Arboretum of Harvard University, have operated in most parts of Kwangsi. Yet it is clear that the area has not been thoroughly covered from a botanical standpoint, and the desirability of additional future explorations is indicated. The material assembled at the Arnold Arboretum, on which this study is based, represents that institution's share of the collections made under coöperative arrangements with the several Chinese institutions.

This study is based on representatives of a few selected families of plants and clearly indicates what may be expected in the form of additions to our knowledge of the flora of China as the work of identification progresses. Twenty-six new species and two new varieties are described, nine of the species having been so designated by Dr. E. D. Merrill in his preliminary work on the collections. This study was made possible by a grant from the Milton Fund of Harvard University to Dr. Merrill, to assist him in preparing data for publication on the very extensive collections of Chinese botanical material assembled at the Arnold Arboretum in recent years.

PROTEACEAE

Helicia Loureiro*Helicia vestita* W. W. Smith var. *mixta* var. nov.

A typo differt foliis brevioribus latioribus integris vel sursum irregulariter paucé dentatis.

HAINAN: Man-ning, S. K. Lau 28252, Nov. 26, 1936, a tree 10 m. high, in forest, fruit green. KWANGTUNG: Shih Wan Tai Shan, H. Y. Liang 69841, July 23, 1937, a tree 12 m. high, in mixed forests. KWANGSI: Shang-sze District, Shih Wan Tai Shan, near Iu Shan Village, W. T. Tsang 22430, June 2-7, 1933, a tree 22 ft. high, fairly common in thickets, flowers yellow; Tseung-yuen, Liow Shiang, C. Wang 39624 (TYPE), June 30, 1936, a tree 20 m. high, in thin woods, flowers white.

These specimens closely resemble each other and represent a form differing from the Yunnan type in that the leaves are shorter and relatively broader (about 10-16 cm. long and 5.5-6 cm. broad), entire or with only a few shallow distant teeth near the apex.

ANNONACEAE

Orophea Blume

Orophea anceps Pierre, Fl. For. Cochinch. 1: t. 46. 1881; Finet & Gagnep. in Lecomte, Fl. Gén. Indo-Chine 1: 117. 1908.

KWANGSI: Pin-lam, S. P. Ko 55657, Aug. 29, 1935, a shrub on forested slopes, fruits yellowish red.

Although three species of *Orophea* are known from Hainan, this is the first record of the genus in continental China. Indo-China.

HAMAMELIDACEAE

Corylopsis Siebold & Zuccarini

Corylopsis cordata Merrill in herb. sp. nov.

Frutex 2–3 m. altus, ramulis glabris rubro-brunneis parce lenticellatis; foliis subchartaceis petiolatis glabris utrinque subconcoloribus oblongo-ovatis vel subelliptico-ovatis, 10–15 cm. longis, 6–9 cm. latis, perspicue acute acuminatis, basi distinete cordatis, margine sinuato-dentatis, dentibus longe mucronulatis, nervis lateralibus utrinsecus 7–9 laxis, inferioribus parce ramosis, cum costa supra leviter impressis, subtus elevatis perspicuis, venulis dense reticulatis tenuibus, supra leviter elevatis, subtus perspicuis; petiolis 2–2.5 cm. longis glabris; floribus ignotis; infructescentiis subspicatis vel racemosis, 3–3.5 cm. longis, pedunculis circa 1 cm. longis, pubescentibus vel glabrescentibus; capsulis 1 cm. longis, 8 mm. crassis, glabris, brunneis subsessilibus vel breviter crasseque pedicellatis; seminibus nigris, 8 mm. longis, laevibus, nitidis.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, near Iu Shan Village, W. T. Tsang 22261 (TYPE), May 11, 1933, a fairly common shrub 2 m. high in thickets; Shih Wan Tai Shan, Tang Lung Village, W. T. Tsang 24256, Sept. 14, 1934, a shrub 10 ft. high, fairly common in thickets; Shih Wan Tai Shan, Nam She Village, W. T. Tsang 24747, Nov. 26, 1934, like the preceding number.

A species close to *Corylopsis Wilsonii* Hemsley, differing in the broader leaves, which are glabrous on both surfaces and more strongly toothed, the shorter infructescences, and the smaller fruits.

Eustigma Gardner & Champion

Eustigma Balansae Oliv. in Hook. Ic. Pl. 20: t. 1954. 1891; Guillaum. in Lecomte, Fl. Gén. Indo-Chine 2: 710. 1920.

KWANGSI: Lin Yuin District, Na I, A. N. Steward & H. C. Cheo 696, June 14, 1933, a shrub 6 m. high, in valley, alt. 1000 m., fruits (immature) green.

This species was originally described from Tonkin, in Indo-China. New to China.

SIMARUBACEAE

Brucea J. F. Miller

Brucea acuminata sp. nov.

Frutex, ramis rubro-brunneis subdense albo-lenticellatis; foliis 40–45 cm. longis, rhachibus teretibus puberulis, petiolis 7–8 cm. longis, teretibus puberulis; foliolis circa 15, oppositis, breviter petiolulatis chartaceis, oblongo-lanceolatis, 5–8 cm. longis, 1.5–2.5 cm. latis, longe graciliter acuminatis, basi obtusis vel late acutis, aequalibus vel subobliquis, margine

integris, supra atro-viridibus, subtus viridibus, utrinque minute consperse pubescentibus, nervis lateralibus utrinsecus 8–10, supra subconspicuis, subtus elevatis distinctis, venis tertiaris supra inconspicuis, subtus conspicuis vel obscuris, petiolulis ad 3 mm. longis; floribus ignotis; infructescentiis axillaribus (ut videtur, plerumque in axillis defoliatis) gracilibus elongatis, ad 15 cm. longis, rhachibus parce puberulis vel glabratris, pedicellis 4–5 mm. longis, puberulis, calyx persistente minuto 4-partito, fructibus ovoideis, 8–9 mm. longis, 6–7 mm. crassis, in sicco brunneis (ex collectore rubris), extus glabris in sicco subreticulatis.

KWANGSI: Ching Hsi District, S. P. Ko 56114 (TYPE), Dec. 10, 1935, a shrub along roads in the margins of thickets or forests.

This species is apparently allied to *Brucea mollis* Wall., originally described from India, its variety *tonkinensis* Lecomte being recorded from Indo-China and from southern China. The new species is distinguished by its much smaller, narrower, longer acuminate, and shorter petiolulate leaflets and its slender infructescences.

STERCULIACEAE

Reevesia Lindley

Reevesia tomentosa sp. nov.

Arbor circa 12 m. alta, ramis teretibus stellato-tomentosis, ramulis dense stellato-tomentosis, indumento ferrugineo; foliis subcoriaceis oblongo-ovatis, 8–14 cm. longis, 3–6 cm. latis, acutis vel obtusis, basi rotundatis vel obscure subcordatis, supra olivaceis, disperse stellato-tomentosis, subtus pallidioribus dense brunneo-tomentosis, nervis lateralibus utrinsecus 6–10, supra impressis, subtus elevatis, venis tertiaris supra leviter impressis, subtus subconspicuis; petiolo dense brunneo-tomentoso, 1–3 cm. longo; floribus ignotis; fructibus longe pedicellatis, lignosis, circa 4 cm. longis, 3 cm. latis, oboviedo-oblongis, apice rotundatis leviter depresso, basi acutis, extus dense stellato-tomentosis, indumento ferrugineo; pedicellis 2.5–3 cm. longis; seminibus circa 2.6 cm. longis, alis brunneis circa 2.2 cm. longis, basim versus 0.8 cm. latis, oblongis, apice oblique rotundatis.

KWANGSI: Yung District, Ta Tseh Tsuen, A. N. Steward & H. C. Cheo 922 (TYPE), Sept. 3, 1933, a tree 12 m. high, valley roadside, alt. 350 m.

A species allied to *Reevesia pubescens* Mast., but the leaves are more densely tomentose beneath and also scattered stellate-tomentose above, and the mature fruits are densely covered by brownish stellate hairs.

FLACOURTIACEAE

Hydnocarpus Gaertner

Hydnocarpus Merrillianus sp. nov.

Arbor, ramulis teretibus dense fulvo-pubescentibus; foliis chartaceis oblongo-ellipticis, 18–25 cm. longis, 6.5–11.5 cm. latis, abrupte acutis, basi late acutis, margine integris leviter revolutis, supra atro-viridibus glabris, subtus viridibus parce pubescentibus, venis lateralibus utrinsecus 7 vel 8, supra conspicuis, subtus elevatis distinctis, valde arcuatim adscendentibus, venulis reticulatis, utrinque perspicuis; petiolis 1.5–3.5 cm. longis, dense fulvo-pubescentibus; floribus ignotis; fructibus magnis axillaribus solitariis globosis, junioribus dense fulvo-pubescentibus, maturis

castaneo-velutinis, 8 cm. diametro, pericarpio 5 mm. crasso; seminibus numerosis compresso-ovoideis, 2.5 cm. longis, 1.7 cm. latis; pedicellis 1 cm. longis.

KWANGSI: Tai Chin Shan, S. P. Ko 55311 (TYPE), June 14, 1935, 55421, July 4, 1935, a tree, in woods or borders of woods on slopes.

This is the second species of the genus known from China and the first one from continental China, the other, *Hydnocarpus hainanensis* (Merr.) Sleumer, being known from Hainan. This new species is characterized by the large, entire leaves with densely pubescent petioles, and the large globose fruits.

PASSIFLORACEAE

Passiflora Linnaeus

Passiflora Papilio sp. nov.

Suffruticosa scandens glabra, ramis sublignis gracilibus 2.5 mm. diametro, ramiculis ultimis 1 mm. diametro; foliis subchartaceis, petiolatis, supra in sicco olivaceis, subtus pallide glaucescentibus minute consperse puberulis, 3–5 cm. longis, 9.5–12 cm. latis, basi rotundato-truncatis, apice latissime retusis in lobos 2 ovatos magnos divergentes rotundato-acuminatos abeuntibus, quo 5–7 cm. longo, 2.5–4 cm. lato, margine integris, costa media in mucronulum brevissimum abeunte, nervis lateralibus circa 3, jugo maximo subtriplinervio manifesto ramoso, caeteris subobscursis, venulis supra obscuris, subtus subconspicuis; petiolis circa 3 cm. longis, in partibus inferioribus glandulas binas ferentibus; cirrhis gracilibus glabris ad 6 cm. longis; floribus ignotis; fructibus globosis, 1–1.2 cm. diametro, pedicellis gracilibus, 1 cm. longis, medium versus articulatis; seminibus 3.5 mm. longis, cinereonigris foveolatis.

KWANGSI: Tai Chin Shan, S. P. Ko 55426 (TYPE), July 7, 1935, scandent on trees on slopes.

A very distinct species, characterized by the broad, divergently 2-lobed leaves, which suggest a butterfly in shape, and the small fruits. The field label has notes on the flowers, but the specimen studied has only detached fruits, some of them with remnants of the calyx. The available flowering parts are too fragmentary for description, although, judging from the unique shape of the leaves as compared with other Chinese species, the flower is apt to be of interesting structure.

Passiflora kwangsiensis sp. nov.

Passiflora cupiformis sensu Chun, Sunyatsenia 4: 184. 1940, pro parte; non Masters.

Suffruticosa scandens glabra, ramis sublignis 3 mm. diametro; foliis chartaceis glabris late ellipticis vel leviter obovato-ellipticis, 8–11 cm. longis, 7–9.5 cm. latis, latissime rotundatis vel truncato-rotundatis, obscure undulatis, basi rotundatis ad modum angustissime peltatis, 3–5-nerviis, integris, supra in sicco olivaceis, subtus pallidis, costa nervisque utrinque elevatis distinctis, nervis inferioribus ramosis, venulis dense reticulatis, utrinque elevatis conspicuis; petiolis 4–5 cm. longis, in partibus inferioribus glandulas binas ferentibus; cirrhis gracilibus glabris usque ad 7 cm. longis; floribus ignotis; fructibus axillaribus, 2- vel 3-fasciculatis, globosis, circa 2 cm. diametro, glabris; pedicellis 1.5 cm. longis, medium versus articulatis; seminibus 3.5 mm. longis, pallidis, foveolatis.

KWANGSI: Ling Yuin District, S. K. Lau 28577 (TYPE), July 10, 1937, scandent in light woods, fruits green.

A species apparently close to *Passiflora cupiformis* Mast., but differing in the vegetative details, the leaves being broadly elliptic to obovate-elliptic, broadly rounded or truncate-rounded at their apices and sometimes even undulate, their bases being broadly rounded and sometimes very narrowly peltate.

THYMELAEACEAE

Wikstroemia Endlicher

Wikstroemia paniculata sp. nov.

Frutex, ramis ramulisque teretibus glabris gracilibus, ramulis ultimis vix 1 mm. diametro; foliis oppositis chartaceis breviter petiolatis oblongo-ellipticis vel lanceolatis, ad 5.5 cm. longis et 1.6 cm. latis, plerumque acutis, basi acutis vel rotundatis, margine leviter revolutis, utrinque glabris, supra viridibus, subtus paullo pallidioribus, nervis lateralibus circa 20 utrinque subconspicuis in venam a margine ipso circa 1 mm. remotam cum margine parallelam anastomosantibus, venulis obscuris; petiolis ad 3 mm. longis; inflorescentiis terminalibus vel lateralibus paniculatis valde ramosis, ad 5 cm. longis, breviter adpresso pubescentibus, ramis racemiformibus, ad 2.5 cm. longis, pedicellis 0.5–1 mm. longis, sub perianthio articulatis, basi persistentibus; floribus luteis parvis, ad 4 mm. longis, 4-meris, perianthii tubo circa 4 mm. longo et 1.5 mm. crasso, parce pubescente, lobis 4 minutis 0.5 mm. longis; antheris 8, 2-seriatis, linearibus, 0.5 mm. longis; ovario glabro; fructu immaturo ovoideo, 6 mm. longo.

KWANGSI: Ching Sai Village, S. P. Ko 55710 (TYPE), Sept. 7, 1935, a shrub in open places near slopes, flowers yellow.

A distinct species, strongly characterized by its leaves with lateral veins united into a single vein parallel with and close to the leaf-margins, and by the much-branched panicles bearing rather small flowers.

ALANGIACEAE

Alangium Lamarck

Alangium Chungii sp. nov.

Frutex vel arbor parva, ramulis ultimis atro-brunneis gracilibus teretibus leviter adpresso tomentosis vel glabrescentibus; foliis chartaceis longe petiolatis late ovatis, 11–22 cm. longis, 9–16 cm. latis, acutis, basi cordatis valde inaequilateralibus, 3–6-nerviis, margine integris, supra glabris costa nervisque interdum parce tomentosis exceptis, nervis lateralibus utrinque 4–6 prope marginem anastomosantibus, utrinsecus conspicuis, venulis dense reticulatis, utrinsecus perspicuis; petiolis 5–10 cm. longis, teretibus minute adpresso tomentosis; inflorescentiis axillaribus adpresso tomentosis vel subtomentosis, ad 8 cm. longis, 1- vel 2-ramosis, 4–7-floris, pedunculis 2–3.5 cm. longis, pedicellis 1–2 cm. longis; floribus 2–2.5 cm. longis; calycis tubo infundibuliformi, 2 mm. longo, leviter tomentoso, margine minute 5–7-lobato; petalis 6 vel 7 basi leviter cohaerentibus, lanceolatis, 2–2.5 cm. longis, 1.5 mm. latis, extus tomentosis, intus glabris; staminibus 6 vel 7, circa 1.8 cm. longis, filamentis 6 mm. longis, dilatatis dense villosis, antheris linearibus, 1.2 cm. longis, connectivo villoso; disco subgloboso; ovario 1-loculari, stigmate capitato 4-partito; fructu ignoto.

KWANGSI: no data, Z. S. Chung 82038 (TYPE).

A species related to *Alangium platanifolium* (Sieb. & Zucc.) Hance and *A. barbatum* (C. B. Clarke) Harms, differing from the former in the strictly entire leaves and the smaller flowers and from the latter in the longer petiolate leaves, larger flowers, and the densely villose filaments.

CLETHRACEAE

Clethra Linnaeus

Clethra Liangii sp. nov.

Frutex 2–2.5 m. altus, ramis brunneis, ramulis glabris vel novellis plus minusve tomentosis; foliis chartaceis oblongis vel late oblongo-lanceolatis, 6–12 cm. longis, 1.8–3.5 cm. latis, acuminatis, deorsum plus minusve angustatis, basi acutis, distanter serrulatis, deorsum integris, supra atro-viridibus primo minute stellatis, subtus pallide viridibus primo tomentosis, utrinque mox glabris, costa supra impressa, subtus valde elevata, nervis lateralibus utrinsecus 8–12, supra leviter impressis, subtus perspicuis, arcuatim anastomosantibus, venulis subconspicuis vel obscuris; petiolis 6–10 mm. longis: inflorescentiis 1–7 terminalibus racemosis, ad 12 cm. longis, dense stellatim brunneo-tomentosis multifloris, pedunculis ad 3.5 cm. longis, floribus circa 5 mm. longis, pedicellis 2–3 mm. longis, bracteolis lanceolatis, 4–5 mm. longis, tomentosis caducis interdum persistentibus; calyce 2 mm. longo, 5-dentato utrinque tomentoso; petalis 5, retusis albis linear-i-ovatis, 5 mm. longis, glabris; filamentis 3.5 mm. longis, inferne dilatatis, antheris 1.5 mm. longis; ovario dense pubescente; stylis ad 6 mm. longis, glabris, stigmate minute 3-lobato; fructu immaturo 3 mm. diametro, pubescente, stylo persistente, 5 mm. longo.

KWANGTUNG: Ta Mien Shan, Shih Wan Tai Shan, H. Y. Liang 69645 (TYPE), July 14, 1937, a shrub 2 m. high, in dense forest, flowers white. KWANGSI: Pin-lam, Ching Sai, S. P. Ko 55527, Aug. 22, 1935, a shrub 2.5 m. high, on forested slopes, alt. 900 m., flowers white.

A species possibly most closely allied to *Clethra Bodinieri* H. Lév., differing, among other characters, in the numerous racemes with dense brown non-appressed indumentum and stouter pedicels.

Clethra polyneura sp. nov.

Frutex, ramis robustis brunneis junioribus dense breviter substellatim fulvo-pubescentibus; foliis subchartaceis lanceolatis, circa 15 cm. longis et 4 cm. latis, longe acuminatis, basi subrotundatis vel late acutis, margine dense incurvato-serrulatis, deorsum integris, primo pubescentibus, supra mox glabris, subtus mox glabrescentibus costa nervisque interdum parce pubescentibus exceptis, costa supra leviter impressa, subtus elevata, nervis lateralibus utrinsecus 18–25 adscendentibus ad marginem arcuato-anastomosantibus, supra subconspicuis, subtus perspicuis, venulis subconspicuis; petiolis 1–2 cm. longis, pubescentibus; racemis circa 7, subfasciculatis, terminalibus ad 17 cm. longis, densifloris fulvo-tomentosis, pedunculis circa 1 cm. longis, ebracteatis, floribus circa 5 mm. longis, pedicellis 1–2 mm. longis, bracteolis linear-i-lanceolatis ad 7 mm. longis, tomentosis caducis; calyce 2.5 mm. longo, 5-dentato toto subalbido-pubescente; petalis 5 obovatis, 5 mm. longis, apice valde truncatis; filamentis gracilibus 4–5 mm. longis, antheris 1 mm. longis; ovario pubescente; stylis 3 mm. longis, glabris, stigmate integro.

KWANGSI: Ling Wan District, S. K. Lau 28767 (TYPE), in 1937, no field notes available.

This species is very close to *Clethra kaipoensis* H. Lév., differing chiefly in the more narrowly lanceolate leaves, with more numerous lateral veins and closer denticulations, and the elongated lanceolate bracteoles.

COMBRETACEAE

Combretum Linnaeus

Combretum kwangsiense sp. nov.

Frutex scandens, ramis cinereo-albidis, glabris, cortice longitudinaliter rimoso, ramulis dense lepidotis, lepidibus minutis; foliis chartaceis breviter petiolatis ellipticis vel late oblongo-ellipticis, 14–17 cm. longis, 7–10 cm. latis, rotundatis, basi late acutis, margine leviter revolutis, supra olivaceo-viridibus, subtus pallide viridibus, utrinque minute albido-punctatis, nervis lateralibus utrinsecus 7 vel 8, cum costa supra tenuiter subtus valde prominulis, nervis prope marginem arcuato-anastomosantibus, venulis reticulatis, supra subconspicuis, subtus elevatis perspicuis; petiolis circa 1 cm. longis; floribus ignotis; infructescentiis racemosis simplicibus axillaribus, 6–8 cm. longis, polycarpicis, pedunculis 1.5–2 cm. longis, minute lepidotis, fructibus in stipitibus circa 1 mm. longis, luteo-brunneis, e collectore luteis, sparse minute glandulosis (glandulis flavidis), nitidis, in ambitu ellipticis vel elliptico-ovoideis, ad 15–18 mm. longis et latis, 4-alatis, utrinque rotundatis.

KWANGSI: Yang District, Ch'ang An, Steward & Cheo 1194 (TYPE), Oct. 23, 1933, vine, on rocks in forest, alt. 200 m., fruit yellow.

A species allied to *Combretum Alfredii* Hance, but distinguished by the larger, broader leaves, smaller infructescences, and much smaller fruits.

EBENACEAE

Diospyros Linnaeus

Diospyros siderophyllus sp. nov.

Arbor parva 5 m. alta, partibus junioribus fructibusque exceptis glabris (floribus ignotis), ramis teretibus nigris glabris, ramulis ultimis circa 1.5 mm. diametro, brunneis glabris vel breviter adpresso hirsutis; foliis subcoriaceis, oblongis, 8–14 cm. longis, 2–4 cm. latis, breviter obtuse acuminate, basi acutis, supra in sicco atro-olivaceis, glabris, subtus paullo pallidioribus glabris vel consperse breviter adpresso hirsutis, costa supra impressa, subtus valde elevata, nervis lateralibus utrinsecus 10–12, gracilibus curvato-adscendentibus anastomosantibus, supra subconspicuis vel inconspicuis, subtus elevatis, venulis reticulatis, utrinque subconspicuis vel obscuris; petiolis ad 1 cm. longis, crassis nigris glabris vel parcissime hirsutis; fructibus axillaribus vel in axillis defoliatis solitariis sessilibus globosis, circa 2 cm. diametro, dense breviter adpresso brunneo-hirsutis, 5- vel 6-loccellatis; seminibus circa 8 mm. longis et 5 mm. latis, compressis, albumine aequabili; sepalis 4 sub fructu patulis valde coriaceis late triangularibus, circa 8 mm. longis et 6 mm. latis, acutis hirsutis.

KWANGSI: Pin-lam, S. P. Ko 55679 (TYPE), Sept. 1, 1935, a small tree 5 m. high, in forests on or near slopes; On Tak, S. P. Ko 55773, Sept. 19, 1935, a small tree 5 m. high, in similar habitats.

In the vegetative characters, this species resembles *Diospyros Roi* H.

Lecomte, differing in the leaves being generally narrower, olivaceous when dry, and with more numerous lateral veins. It differs further in the fruit, with its persistent calyx, which is densely brownish-appressed-hirsute, while the seeds are fewer in number.

STYRACACEAE

Styrax Linnaeus

Styrax oligophlebius Merrill in herb. sp. nov.

Frutex 2.5 m. altus, ramulis novellis dense breviter stellatim brunneotomentosis; foliis chartaceis vel subcoriaceis, supra glabris viridibus nitidis, subtus dense stellatim subfulvo-tomentosis oblongis, 4–6 cm. longis, 1.5–2.5 cm. latis, breviter acuminatis, basi acutis, integris, nervis lateralibus utrinsecus 5 vel 6, cum costa supra subconspicuis leviter impressis, subtus elevatis prominulis, venis tertiaris utrinque obscuris; petiolis 0.8–1.3 cm. longis, dense breviter stellatim tomentosis; inflorescentiis infructescientiisque ignotis; fructibus globosis, circa 1.2 cm. diametro, globosis vel subovoideis, rotundatis, extus dense cinereo-tomentosis, calyce persistente cupulato, 6 mm. alto, cinereo-tomentello leviter irregulariter lobato; pedicello circa 3 mm. longo.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, Tang Lung Village, *W. T. Tsang 24489* (TYPE), Oct. 1–16, 1934, scattered shrubs, about 2 m. high, fairly common.

A distinct species, strongly characterized by its rather small, coriaceous, few-nerved leaves, which are green, glabrous, and glossy above and densely and brightly brownish-tomentose beneath, with short crowded stellate hairs.

SYMPLOCACEAE

Symplocos Jacquin

Symplocos kwangsiensis Merrill in herb. sp. nov. Subgen. *Hopea*, § *Bobua*, *Lodhra*.

Frutex circiter 2 m. altus, ramis nigris, primo plus minusve pubescentibus, vetustioribus glabris, ramulis novellis dense brunneo-pilosis atque longe ciliatis; foliis chartaceis utrinque subconcoloribus, supra nitidis, subtus longe ciliatis, oblongo-ovalis vel late ovato-lanceolatis, 2.5–4 cm. longis, 1–1.5 cm. latis, longe acute acuminatis, basi late acutis vel rotundatis, margine glanduloso-serrulatis, costa supra leviter impressa pilosa vel glabrata, nervis lateralibus utrinsecus 3 vel 4 utrinque subconspicuis arcuato-anasto-mosantibus, venis tertiaris obscuris; petiolis 2 mm. longis, ciliatis; inflorescentiis axillaribus in ramulis hornotinis fasciculatis subsessilibus pauci-floris; floribus sessilibus, bracteis late ovatis, dense pubescentibus, 1 mm. longis; calycis tubo crasso, circa 1 mm. longo, lobis 5 late ovatis pubescentibus, 1 mm. longis; petalis 5 albis oblongis, 3.5 mm. longis, utrinque glabris; staminibus circa 20–25, filamentis liberis, glabris, circa 4 mm. longis; disco annulari cinereo-pubescente; ovario 3-loculari, stylo 5 mm. longo; fructibus ovoideis, 6 mm. longis, 4.5 mm. crassis, viridibus.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, Tang Lung Village, *W. T. Tsang 24383* (TYPE), Sept. 30, 1934, a shrub 5 ft. high, fairly common on dry steep slopes, in thickets, flowers white, fragrant. KWANGTUNG: Shih Wan Tai Shan, *H. Y. Liang 70044*, Aug. 7, 1937, shrub, 2 m. high, in dense woods, fruits green to black.

A distinct species, apparently allied to *Symplocos glandulifera* Brand and *S. yunnanensis* Brand, both of Yunnan, the latter extending also to

Kwangsi and Indo-China. It may be readily distinguished from both of these, among other characters, by its unusually small leaves.

Symplocos mollipila sp. nov. Subgen. *Hopea*, § *Bobua*, *Lodhra*.

Frutex vel arbor parva, ramulis novellis teretibus gracilibus dense fulvo-villosis; ramis vetustioribus plus minusve pubescentibus, glabrescentibus, foliis chartaceis breviter petiolatis oblongis, 5–10 cm. longis, 2.5–4 cm. latis, perspicue acuminatis, basi late cuneatis vel rotundatis, margine integris, supra subnitidis breviter et conspersissime pubescentibus, subtus molliter pilosis, costa supra leviter impressa dense pubescente, subtus elevata, nervis lateralibus utrinsecus circa 10, utrinque subconspicuis, prope marginem anastomosantibus; petiolis 2–3 mm. longis, dense villosis; floribus ignotis; infructescentiis axillaribus fasciculatis subsessilibus 1–4-fructigeris, bracteis minutis, late ovatis, 1.5 mm. longis, pubescentibus, fructibus ellipsoideis, 1 cm. longis, 7.5 mm. crassis, parce pubescentibus vel glabrescentibus, leviter longitudinaliter sulcatis, 3-locularibus, lobis calycinis persistentibus rotundatis, 1.5 mm. longis, pubescentibus.

KWANGSI: Ling Wan District, S. K. Lau 28722, 28725 (TYPE), 1937, no field notes available.

A species apparently close to *Symplocos glandulifera* Brand, differing in the shorter leaves, which are not glandular on the margins and which have broader, sometimes rounded bases, as well as in the shorter fruits.

Symplocos punctato-marginata A. Chev. ex Guillaum. Bull. Soc. Bot. France **79**: 174. 1932; Lecomte, Fl. Gén. Indo-Chine **3**: 1004. 1933; Merr. Lingnan Sci. Jour. **15**: 424. 1936.

Symplocos Stewardii Sleumer, Repert. Sp. Nov. **42**: 266. 1937, syn. nov.

KWANGSI: Yung District, Ta Tseh Tseun, A. N. Steward & H. C. Cheo 771 (iso-syntype of *S. Stewardii* Sleumer), Aug. 8, 1933, a shrub 5 m. high, in valley forests, alt. 540 m., flowers white, fragrant, 865 (isosyntype of *S. Stewardii* Sleumer), Aug. 1933, a tree 12 m. high, in forests, alt. 540 m., flowers white, fragrant; Shang-sze District, Shih Wan Tai Shan, near Hoh Lung Village, W. T. Tsang 22569 (isosyntype of *S. Stewardii* Sleumer), June 26, 1933, a shrub 10 ft. high, fairly common, in thickets, flowers white; Shih Wan Tai Shan, Tang Lung Village, W. T. Tsang 24189, Sept. 4, 1934, a shrub 15 ft. high, fairly common in thickets, flowers white, fragrant, fruits black.

Originally described from Indo-China. In recording the species from Kwangtung, Merrill has also noted the occurrence of Chevalier's species in Kwangsi, mentioning *Steward & Cheo* 771 and 865. This was apparently overlooked by Sleumer. An additional specimen, besides those noted by Merrill and by Sleumer, *Tsang* 24189, shows that, together with the other specimens, the Kwangsi plant is virtually the same as the Indo-Chinese species.

Symplocos myriadenia Merr. Univ. Calif. Publ. Bot. **10**: 428. 1924.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, near Hoh Lung Village, W. T. Tsang 22568, June 26, 1933, 22648, July 6, 1933, a small tree 9–15 ft. high, fairly common in thickets; Ling Wan District, S. K. Lau 28627, 1937. Indo-China. New to Kwangsi.

Symplocos anomala Brand, var. **nitida** var. nov.

A typo differt foliis 8–12 cm. longis, 3–5 cm. latis, supra valde nitidis, inflorescentiis calycibusque glabris.

KWANGSI: Waitsap District, Tong Shan, near Sap-luk Po Village, *W. T. Tsang* 22738, Sept. 8, 1933, 22752, Sept. 10, 1933, a shrub 5-9 ft. high, in thickets, flowers white, fragrant, fruit black; Shang-sze District, Shih Wan Tai Shan, Tang Lung Village, *W. T. Tsang* 24389, Sept. 30, 1934, 24423 (TYPE), Oct. 1-16, 1934, a shrub 9-15 ft. high, fairly common in thickets, flowers white, fragrant.

This differs from the typical form of the species, which occurs in Szechuan, Kweichow, Hupeh, Hunan, Kiangsu, Anhwei, Chekiang, Fukien, Kwangsi, and Hainan, in the larger strongly shining leaves and the glabrous inflorescences and calyces.

RUBIACEAE

Xanthophytopsis Pitard

Xanthophytopsis kwangtungensis Chun & How, Sunyatsenia 4: 14. pl. 5. 1939.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang* 22306, May 16, 1933, 22485, June 17, 1933, 23966, July 11-30, 1934, 23975, Aug. 8, 1934, 24532, Oct. 22-31, 1934. A woody plant 1-1½ ft. high, fairly common in thickets.

This species, originally described from Kwangtung, is the second species of the genus, which was originally described from Indo-China material. New to Kwangsi. The specimens above cited are all from various localities in the Shang-sze District, close to the Kwangtung border.

Ophiorrhiza Linnaeus

Ophiorrhiza succirubra King ex Hook. f. Fl. Brit. Ind. 3: 82. 1880.

KWANGSI: Waitsap District, Sze Tze Shan, near Tung Chung Village, *W. T. Tsang* 23347, Dec. 4-6, 1933, 1 ft. high, fairly common in thickets, flowers white, odorless; Shang-sze District, Shih Wan Tai Shan, Nam She Village, *W. T. Tsang* 24632, Nov. 11, 1934, 24740, Nov. 25, 1934, semi-woody, fairly common in thickets, flowers white or purplish-red, fragrant; Yao Shan, *C. Wang* 40467, Dec. 14, 1936, near streams, flowers white.

These specimens seem to represent the same entity as *Henry* 11345 from Yunnan, which Dunn, Jour. Linn. Soc. Bot. 39: 471. 1911, has identified as representing King's species. Himalayan region to Yunnan, and, if our identification is correct, also in Kwangsi.

Ophiorrhiza kwangiensis Merrill in herb. sp. nov.

Herba prostrata adscendens 15-18 cm. alta ramosa, caulis circiter 1 mm. diametro teretibus glabris, ramulis ultimis circa 0.5 mm. diametro plus minusve breviter curvato-hirsutis; foliis in paribus subaequalibus chartaceis vel submembranaceis cordato-ovatis, 1.5-1.75 cm. longis, 1-1.5 cm. latis, acutis, basi cordatis, utrinque glabris, in sicco supra subolvaceis, subtus pallidioribus, nervis lateralibus utrinsecus circa 5 obliquis, venulis inconspicuis; petiolis 0.5-1.5 cm. longis, glabris gracilibus; stipulis caducis; inflorescentiis terminalibus breviter pedunculatis (pedunculo sub fructu ad 12 mm. longo) cymosis paucifloris breviter pubescentibus, floribus immaturis circiter 2.5 mm. longis, pedicellis puberulis ad 1 mm. longis; bracteis bracteolisque linearibus vel lineari-lanceolatis acuminatis circiter 5 mm. longis, obscure conperse pubescentibus; sepalis 5 oblongo-lanceolatis acutis 1 mm. longis; corolla immatura 3 mm. longa; capsula pedicellata, circa 6 mm. lata et 2 mm. alta, breviter puberula, pedicellis ad 5 mm. longis.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, Hoh Lung Village, *W. T. Tsang*

22425 (TYPE), June 4, 1933, 5 in. high, fairly common in thickets on steep slopes; Shih Wan Tai Shan, Tang Lung Village, W. T. Tsang 24388, Sept. 30, 1934, fairly common on steep slopes, flowers pale yellow.

A species characterized by its habit and by its small leaves and flowers.

Luculia Sweet

Luculia intermedia Hutchinson in Sargent, Pl. Wils. 3: 408. 1916.

KWANGSI: Pin-lam, S. P. Ko 55584, Aug. 23, 1935, a shrub 1 m. high, in woods on slopes; Ching Sai Village, S. P. Ko 55718, Sept. 7, 1935, a shrub on slopes, flowers white. Burma and Yunnan.

Adina Salisbury

Adina Metcalfii Merrill in herb. sp. nov.

Frutex circa 2 m. altus, ramulis novellis castaneis, obscure tetragonis, glabris vel subglabris; foliis chartaceis petiolatis utrinque glabris, oblongis vel obovato-oblongis, 8–13.5 cm. longis, 3–5 cm. latis, perspicue acuminatis, basi longe attenuatis, supra olivaceo-viridibus, subtus paullo pallidioribus, costa supra leviter impressa, subtus elevata, nervis lateralibus utrinsecus 8–10, adscendentibus prope marginem anastomosantibus, supra subconspicuis, subtus elevatis, venis tertiaris utrinque subconspicuis; petiolis 1.5–2.5 cm. longis, tenuibus; inflorescentiis terminalibus, ad 8 cm. longis, glabris, capitulis circa 1.5 cm. diametro, 5–7-racemosim dispositis, interdum foliis reductis subtentis, pedunculis gracilibus, 2.5–5.5 cm. longis; calyce hirsuto, lobis oblongis, circa 1 mm. longis, obtusis; corollae tubo circa 4 mm. longo, glabro, lobis 5 ovatis glabris, circa 1 mm. longis; staminibus fauce corollae insertis, antheris apiculatis inclusis; stylis exsertis, circa 8 mm. longis, stigmate subgloboso.

KWANGSI: Ch'uan District, Pai-yun-an and vicinity, W. T. Tsang 27683 (TYPE), June 18, 1937, a shrub about 2 m. high, fairly common in thickets, flowers yellow, fragrant.

In the racemously arranged heads, this new species is allied to *Adina racemosa* Miq., differing, however, in the much narrower, long attenuate leaves and the glabrous corollas.

Mussaenda Linnaeus

Mussaenda anomala sp. nov.

Frutex scandens, ramulis pallide brunneo-cinereis consperse lenticellatis subadpresso pilosis glabrescentibus; foliis in paribus aequalibus ovatis vel elliptico-ovatis, 13–17 cm. longis, 7.5–11.5 cm. latis, acuminatis, basi acutis, utrinque conspersissime breviter pubescentibus, supra viridibus, subtus pallidioribus, nervis lateralibus utrinsecus 8–10, supra conspicuis, subtus elevatis curvato-subadscendentibus, venulis reticulatis, supra subconspicuis, subtus gracilibus; petiolis 2–2.5 cm. longis, leviter pubescentibus; stipulis caducis; inflorescentiis terminalibus sessilibus cymosis multifloris trichotomo-ramosis breviter subadpresso pubescentibus, circa 6 cm. longis; bracteis caducis, bracteolis acuminatis, lanceolatis pubescentibus ad 1 cm. longis, deciduis; pedicellis 2–3 mm. longis; calycis tubo oblongo, circa 5 mm. longo, adpresso subhirsuto, lobis plerumque 5, omnibus petaloideis, in lamina ampla petiolatis productis albis ovato-ellipticis, 2–4 cm. longis, 1.5–2.5 cm. latis, acutis, basi acutis vel cuneatis 5-nerviis, margine nervisque plus minusve pubescentibus, stipite 1.5–2.5 cm. longo; corollae tubo

(alabastro) circa 1.2 cm. longo et 4 mm. crasso, superne ampliato, extus dense adpresso pubescente, intus superne dense sulphureo-piloso, inferne glabro. lobis plerumque 5, ovatis, breviter acuminatis, circa 3 mm. longis (immaturis), extus pubescentibus; staminibus 4 vel 5, in tubo insertis, antheris elongatis, 3 mm. longis, inclusis, subsessilibus; ovario 2-loculari, disco annulari, stylis circa 6 mm. longis, inclusis, stigmatibus 2 linearibus compressis, 4 mm. longis; fructu immaturo 6 mm. longo, 4 mm. crasso, seminibus ignotis.

KWANGSI: Tseung-yuen, Yao Shan, C. Wang 39567 (TYPE), June 27, 1936, climbing on trees.

In the large, broad, thin leaves, this species superficially resembles *Mussaenda Esquirolii* H. Lév. (*M. Wilsonii* Hutchinson). Its one outstanding character, in which it differs from all other known representatives of the genus from China and Indo-China, and for that matter from most previously known representatives of the genus, is that not one but all of the calyx-lobes are accrescent and petaloid. This character has been noted in the Philippine *Mussaenda philippica* Rich. var. *aurorae* Sulit, Philip. Jour. Forestry 2: 39. t. 3. f. 1. 1939.

***Mussaenda kwangsiensis* sp. nov.**

Frutex scandens, ramulis teretibus dense adpresso pubescentibus; foliis tenuiter chartaceis in paribus aequalibus oblongo-lanceolatis vel lanceolatis, 8–11 cm. longis, 2.5–4 cm. latis, longe acute acuminatis, basi attenuatis vel cuneatis, supra sparse adpresso pubescentibus, subtus consperse molliter pubescentibus. nervis lateralibus utrinsecus 6–8 curvato-adscentibus, utrinque conspicuis, venis tertiaris inconspicuis; petiolis 5–8 mm. longis, adpresso pubescentibus, axillis plerumque folia 2–4 valde reducta gerentibus; stipulis linearibus, 6 mm. longis, caducis; inflorescentiis terminalibus cymosis compactis, circa 4 cm. longis, vix ramosis, perspicue adpresso pubescentibus, bracteis bracteolisque linearibus, 0.5–1.5 cm. longis; floribus sessilibus confertis; calycis tubo oblongo, circa 5 mm. longo, dense pubescente, 5-lobato, lobis normalibus linearibus, 2.5–3 cm. longis, 1–2 mm. latis, sparse pilosis, longe acuminatis, lobis petaloideis paucis ovatis, saltem 6 cm. longis, 5–7-nerviis, acuminatis, utrinque consperse pubescentibus, stipitatis; corollae tubo 2–2.5 cm. longo, 1.5 mm. lato, sursum breviter ampliato, extus perspicue cinereo-pubescente, intus superne villoso, lobis 5 ovatis, 3 mm. longis, 1.5 mm. latis, acuminatis vel mucronatis; staminibus inclusis, antheris 4–5 mm. longis, filamentis glabris; stylo brevi, 5 mm. longo, glabro.

KWANGSI: Tseung-yuen, Yao Shan, C. Wang 40448 (TYPE), Nov. 9, 1936, scandent in thickets, flowers yellow.

A species apparently in the group with *Mussaenda hirsutula* Miq., differing in the longer and narrower leaves and in the very slender, extremely long normal calyx-lobes, which mostly exceed the corollas in length.

***Mussaenda densiflora* sp. nov.**

Frutex scandens saltem 2 m. altus, ramis teretibus perspicue villosis; foliis membranaceis vel tenuiter chartaceis in paribus aequalibus, late oblongo-lanceolatis vel anguste oblongo-ellipticis, 8–13 cm. longis, 3–5 cm. latis, longe acute acuminatis, basi acutis, plerumque late acutis, raro subrotundatis, supra conspersissime breviter ciliatis, subtus praesertim secus

costam nervosque molliter pubescentibus, nervis lateralibus utrinsecus 8–10, curvato-adscendentibus, utrinque conspicuis, venis tertiaris inconspicuis vel subconspicuis; petiolis 1–2 cm. longis, pubescentibus; stipulis linearibus, 3–4 mm. longis, caducis; inflorescentiis terminalibus cymosis compactis, subcapitatis, circiter 6 cm. longis, breviter ramosis, perspicue molliter pubescentibus, bracteis bracteolisque linearibus, 1–1.5 cm. longis; floribus sessilibus, confertis; calycis tubo crasso, 2–3 mm. longo, dense pubescente, lobis plerumque 5, normalibus linearibus 8–15 mm. longis, 1–2 mm. latis, pubescentibus, uno interdum petaloideo ovato, 5–6 cm. longo, ad 3.5 cm. lato, acuto, utrinque consperse pubescente, stipitato, nervis 5–7, stipite circiter 1.5 cm. longo; corollae tubo 3–3.5 cm. longo, 1.5 mm. lato, sursum breviter ampliato, extus perspicue cinereo-pubescente, intus superne villoso, lobis 5, oblongo-lanceolatis, 7–8 mm. longis, 2–3 mm. latis, longe acuminate, extus sparse pubescentibus vel glabrescentibus; staminibus inclusis, tubo in $\frac{1}{5}$ superiore insertis, antheris 5–6 mm. longis, filamentis glabris; stylo glabro, 8 mm. longo, 2- vel 3-lobato; fructu ovoideo, 8–9 mm. longo, 6–7 mm. crasso, glabro, sepalis deciduis.

KWANGSI: Tai Ching Shan, S. P. Ko 55121 (TYPE), May 25, 1935, a small scandent shrub, in woods, alt. 1250 ft., flowers yellow; Ching Sai Village, S. P. Ko 55711, a climber, fruit green.

This species is allied to *Mussaenda subsessilis* Pierre of Indo-China, differing chiefly in the much smaller petaloid sepals and the much longer and narrower corolla-lobes. A collection from Tonkin, Indo-China, W. T. Tsang 29049, is referable to this same species. The fruits have been described from S. P. Ko 55711, of which the leaf-bases are distinctly rounded rather than broadly acute.

Randia Linnaeus

Randia salicifolia sp. nov.

Frutex erectus glaber, ramis ramulisque gracilibus teretibus, ramulis circa 1.5 mm. diametro; foliis chartaceis glabris breviter petiolatis lanceolatis, 15–19 cm. longis, 1.5–3 cm. latis, sursum longe angustatis, apice acute acuminatis, basi acutis, supra atro-olivaceis, subtus pallidioribus, nervis lateralibus utrinsecus 9–12 gracilibus, utrinque subdistinctis, prope marginem arcuato-adscendentibus, reticulis obsoletis; petiolo 5–8 mm. longo; stipulis triangularibus, longe acuminatis, circa 6 mm. longis; floribus ignotis; infructescentiis oppositifoliis depauperato-cymosis, circa 1.5 cm. longis, fructibus junioribus globosis, circa 8 mm. diametro, in siccitate nigris, nitidis; pedicellis 4 mm. longis, bracteis minoribus oblongis circa 1 mm. longis.

KWANGSI: Ping-nan District, C. Wang 40398 (TYPE), Nov. 2, 1936, a shrub, in dense forests, fruits green.

This species is manifestly close to *Randia Henryi* Pritzel, differing particularly in its elongated narrow leaves and reduced infructescences.

Ixora Linnaeus

Ixora Tsangii Merrill in herb. sp. nov.

Frutex parvus 1 m. altus, inflorescentiis leviter pubescentibus exceptis glaber, ramis teretibus 3 mm. diametro, internodiis 2.5–3.5 cm. longis; foliis chartaceis oblongo-lanceolatis, 13–20 cm. longis, 3–6 cm. latis, longe acuminatis, basi late acutis, subolivaceis subopacis, nervis lateralibus utrinsecus

14–16, supra distinctis, subtus elevatis, prope marginem arcuato-anastomosantibus; petiolis 1–1.5 cm. longis; stipulis circa 8 mm. longis deorsum oblongo-ovatis subabrupte caudato-acuminatis caducis; cymis terminalibus sessilibus e basi ramosis, circa 3.5 cm. longis, leviter pubescentibus trichotome ramosis, ramis primariis haud 1 cm. longis, floribus plerumque in ramulis secundariis in triadibus dispositis, pedicellatis, pedicellis 3–5 mm. longis, bracteis linear-lanceolatis acuminatis circa 3 mm. longis, bracteolis minoribus; calycibus glabris circa 1.5 mm. longis, lobis ovatis acuminatis quam tubo brevioribus; corolla alba (ex collectore), tubo gracili 1.5–1.8 cm. longo haud barbato, lobis reflexis circa 5 mm. longis subrotundatis; antheris exsertis lanceolatis circa 3.5 mm. longis, stylis exsertis, ramis 1.5 mm. longis.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, Tang Lung Village, *W. T. Tsang* 24240 (TYPE), Sept. 8, 1934, a fairly common shrub in thickets, about 1 m. high, flowers white, fragrant.

This species is allied to *Ixora hainanensis* Merr. & Chun of Hainan, differing in the leaves having more numerous, prominent, and more oblique lateral nerves, and in the much shorter flowers with subrounded corolla-lobes. Moreover, the inflorescences are sessile, while in *I. hainanensis* they are distinctly pedunculate. *H. Y. Liang* 70086, from Shih Wan Tai Shan, Kwangtung Province, unfortunately with immature flowers, may represent the same species.

Psychotria Linnaeus

Psychotria kwangsiensis sp. nov.

Frutex parvus erectus ubique glaber, ramis ultimis crassis, 4 mm. diametro; foliis chartaceis grandis longe petiolatis ellipticis, circa 26 cm. longis et 12 cm. latis, apice acutis vel acuminatis, basi longe attenuatis, supra olivaceo-viridibus, subtus paullo pallidioribus, nervis lateralibus utrinsecus circa 16, utrinque conspicuis, prope marginem tenuiter curvato-arcuatis, venuis utrinque obscuris; petiolis 4–5 cm. longis; stipulis deciduis; floribus ignotis; infructescentiis terminalibus pedunculatis sublaxe cymoso-paniculatis, circa 7.5 cm. longis, pedunculis circa 4.5 cm. longis, bracteis lanceolatis acuminatis, circa 2.5 mm. longis, margine leviter ciliatis; fructibus oblongo-ellipsoideis subsessilibus vel breviter (ad 1 mm.) pedicellatis, 1 cm. longis, 4–5 mm. crassis, longitudinaliter sulcatis, glabris, calycis lobis lanceolatis circa 1 mm. longis plus minusve persistentibus coronatis; seminibus circa 1 cm. longis, plano-convexis, dorso leviter 4-costato, albumine haud ruminato.

KWANGSI: Chen Pien District, *S. P. Ko* 56011 (TYPE), Nov. 5, 1935, on slopes in forested ravines, probably small in size.

A species strongly characterized by its large leaves and its characteristic fruits.

Lasianthus Jack

Lasianthus Tsangii Merrill in herb. sp. nov.

Frutex erectus circa 1 m. altus, ramulis inflorescentiis et foliis subtus villosis, indumento interdum sordide brunneo vel in venuis pallido, ramulis ultimis teretibus 3 mm. diametro; foliis subcoriaceis petiolatis oblongo-lanceolatis, 9–12.5 cm. longis, 3–4.2 cm. latis, acuminatis, basi acutis, supra glabris viridibus subnitidis, subtus paullo pallidioribus praesertim

secus costam nervosque molliter villosis, nervis lateralibus utrinsecus 5–7, supra leviter impressis, subtus elevatis, perspicuis, curvato-adscendentibus, venis tertiaris parallelis, supra indistinctis, subtus elevatis; petiolo 8–10 mm. longo dense subadpresso hirsuto; inflorescentiis axillaribus sessilibus paucifloris, bracteis lanceolatis, dense villosis, circa 1 cm. longis; floribus sessilibus; calycis tubo circa 4 mm. longo piloso, lobis 5, anguste lanceolatis acuminatis crasse ciliatis circa 3 mm. longis, persistentibus; fructibus subovoideis glabris circa 4 mm. diametro.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, Na Wai Village, *W. T. Tsang* 23940 (TYPE), July 11–30, 1934, a shrub about 1 m. high, fairly common in thickets, fruits blackish blue.

This species is characterized by its prominently nerved leaves, which are glabrous above and prominently villose beneath, with sharply ascending lateral nerves, its axillary, few-flowered inflorescences with elongated, persistent, lanceolate, and densely villose bracts, and its persistent pubescent calyx-lobes. It resembles *L. Koi* Merr. & Chun in vegetative characters, but the leaves of the latter are narrowly caudate-acuminate, while the inflorescences are more crowded, more numerously flowered, and with numerous narrow and villous bracts.

***Lasianthus kwangsiensis* Merrill in herb. sp. nov.**

Frutex erectus, ramis ramulisque pubescentibus, ramulis teretibus junioribus interdum obscure compressis olivaceis 1–2 mm. diametro; foliis chartaceis breviter petiolatis ovatis vel oblongo-ovatis, 6–9.5 cm. longis, 2.5–3.8 cm. latis, caudato-acuminatis, basi acutis, margine leviter revolutis, olivaceis, supra glabris, subtus ad costam nervosque distincte pubescentibus, nervis lateralibus utrinsecus 6 vel 7, utrinque distinctis, curvato-adscendentibus arcuato-anastomosantibus plerumque dense ciliatis, venis tertiaris parallelis supra subconspicuis, subtus distinctis; petiolo 5–7 mm. longo; stipulis dense pilosis caducis; inflorescentiis axillaribus sessilibus multifloris, bracteis minutis deciduis; floribus subsessilibus confertis fasciculatis; calycis tubo 2 mm. longo, extus dense pubescente, lobis 5 linearibus 2 mm. longis; corollae tubo 5–6 mm. longo hirsuto intus superne tomentoso, lobis 5 oblongo-ovatis circa 1.5 mm. longis; staminibus tubo insertis, antheris subexsertis; stylis tubo corollae subaequilongis, stigmatibus ciliatis 5-lobatis.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, Nam She Village, *W. T. Tsang* 24679 (TYPE), Nov. 18, 1934, a shrub 3 ft. high, in thickets, fairly common, flowers white, fragrant.

This species is near *Lasianthus Fordii* Hance, but it may be distinguished, among other characters, by its corolla being prominently hirsute.

***Paederia* Linnaeus**

***Paederia pertomentosa* Merrill in herb. sp. nov.**

Suffruticosa vel herbacea scandens, circa 3.5 m. alta, caulis et ramis et foliis subtus dense breviter tomentosis, caulis teretibus 2 mm. diametro, indumento sordide substramineo, ramulis circa 1 mm. diametro; foliis chartaceis, ovato-ellipticis vel oblongo-ellipticis, acute acuminatis, basi plerumque rotundatis, haud cordatis, interdum leviter decurrentibus, 6–11 × 2.5–5 cm., supra subolivaceis conserpe puberulis ad costam dense puberulis,

subtus densissime breviter subalbido-tomentosis, nervis primariis utrinsecus circa 8; petiolo puberulo, 2–5 cm. longo; inflorescentiis axillariibus et terminalibus, 15–30 cm. longis, dense breviter pubescentibus, lateralibus plerumque racemiformibus vel deorsum breviter ramosis, floribus in ramis subglomeratim dispositis, glomerulis inter se 1–3 cm. distantibus plus minusve confertis breviter pedicellatis; floribus rosaceis; calycibus dense tomentosis, dentibus triangularibus, acutis, intus glabris; corollae tubo extus dense puberulo, 5 mm. longo, lobis ovatis acutis, 1–1.2 mm. longis.

SOUTHERN KIANGSI: Hong San, *J. L. Gressitt* 1471 (TYPE), June 23, 1936, in thickets, alt. 840 m.; Lung-nan District, Oo Chi Shan, near Lam Uk Village, *S. K. Lau* 4733, Oct. 1–25, 1934, a semi-woody climber, rare on dry steep slopes in forests. KWANGSI: Nam Tan-yuen, *C. Wang* 40918, June 26, 1937, scandent, in forests; Ling-chuan District, Hai-yan-shan, Lian-chai-miao, *W. T. Tsang* 27825, July 13–19, 1937, climber, 3 ft. high, fairly common in thickets on steep slopes.

This is one of the very tomentose forms formerly referred to *Paederia tomentosa* Bl. = *P. scandens* (Lour.) Merr. and to *P. foetida* Linn., but manifestly it is so different from these that there seems to be little justification in extending the limits of either species to take this extreme form. It is allied to *P. Cavaleriei* H. Lév., differing among other characters in the leaves being densely short-white-tomentose beneath.

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STUDIES OF SOUTH AMERICAN PLANTS, X NOTEWORTHY MYRISTICACEAE AND VACCINIACEAE

A. C. SMITH

THROUGH the kindness of the authorities of the U. S. National Herbarium and the Instituto Botanico of Bogotá, a series of Colombian specimens representing the Myristicaceae and Vacciniaceae has been made available to me for study. Most of these specimens were collected in the Comisaria of Putumayo by J. Cuatrecasas and in the Department of Antioquia by R. D. Metcalf and J. Cuatrecasas. One new species is based upon a collection from Antioquia by Brother Daniel, while an Ecuadorean plant collected by A. Rimbach is also described as new. Eleven new species are here described; of interest is the discovery in Colombia for the first time of the genera *Semiramisia* and *Ceratostema* (*sensu vero*). In the following pages the place of deposit of specimens is indicated by parenthetical letters as follows: (A), Arnold Arboretum; (Col), Instituto Botanico, Universidad de Colombia, Bogotá; (US), U. S. National Herbarium.

MYRISTICACEAE

Dialyanthera parvifolia Markgraf in Notizbl. Bot. Gart. Berlin **9**: 964. 1926;
A. C. Sm. in Brittonia **2**: 417. 1938, **3**: 339. 1939.

COLOMBIA: Putumayo: Selva higrófila del río San Miguel, en el afluente izquierda Quebrada de la Hormiga, alt. 290 m., Cuatrecasas 11139 (Col, US); Mocoa, bosque higrófilo en la Quebrada del río Mulato, alt. 570–600 m., Cuatrecasas 11314 (A, Col, US). BOLIVIA: La Paz: Prov. Larecaja, Turi, near Mapiri, alt. 490–750 m., Krukoff 10734 (A, etc.).

In my monograph of 1938 I listed this species only from Peru and adjacent Brazil; the above-cited collections from the Amazonian portions of Colombia and Bolivia demonstrate that the species has a fairly wide range. In 1939 I reported the plant from Venezuela, and another collection from that country (Williams 10210 [A], from National Park, alt. 850–1100 m.) is now available. *Dialyanthera parvifolia* is therefore now known to have a fairly extensive distribution along the western edge of the Amazon basin from Bolivia to Colombia and continuing northward to Aragua in Venezuela.

Virola peruviana (A. DC.) Warb. in Nova Acta Acad. Leop.-Carol. **68**: 188. 1897;
A. C. Sm. in Brittonia **2**: 472. 1938.

COLOMBIA: Putumayo: Selva higrófila del río Putumayo; Puerto Porvenir, arriba de Puerto Ospina, hacia la Loma, alt. 230–250 m., Cuatrecasas 10746 (Col, US).

The cited collection extends to Colombia the range of *V. peruviana*, previously recorded from Amazonian Peru and Brazil, but only from the southern tributaries of the Amazon. The Cuatrecasas specimen has leaf-blades up to 40 by 12.5 cm. (larger than those previously known), and its tomentum is perhaps somewhat more persistent throughout; nevertheless it agrees with earlier collections of the species in all essential details.

Virola calophylla Warb. in Nova Acta Acad. Leop.-Carol. **68**: 231. 1897; A. C. Sm. in Brittonia **2**: 474. 1938.

COLOMBIA: Putumayo: Selva higrófila del río Putumayo; Puerto Porvenir, arriba de Puerto Ospina, hacia la Loma, alt. 230–250 m., Cuatrecasas 10653 (Col, US).

The cited specimen is of especial interest as being the first Colombian collection which can be referred to *V. calophylla* without doubt. Otherwise the species has a range in Amazonian Brazil, Venezuela, and Peru. In 1938 I referred to *V. calophylla* the type of *V. incolor* Warb., a sterile juvenile specimen from Villavicencio, and thus the species has already been reported from Colombia, but only inadequately so. The Cuatrecasas collection, being in fruit, permits a correction of my earlier description. The pubescence of the fruit is much coarser than previously indicated, the individual hairs being somewhat more than 1 mm. in length, copiously jointed, and with numerous minute lateral branches, somewhat like the pubescence illustrated for *V. loretensis* A. C. Sm. (Brittonia **2**: f. 7, g. 1938). Apparently these hairs are at length deciduous, leaving the fruit closely tomentellous.

VACCINIACEAE

Semiramisia pulcherrima sp. nov.

Frutex ad 50 cm. altus ubique filamentis exceptis glaber, ramulis teretibus gracilibus ut videtur elongatis; petiolis subteretibus rugulosis 3–4 mm. longis; laminis subcoriaceis ovatis, 4.5–6 cm. longis, 2.5–3 cm. latis, basi rotundatis vel late obtusis, apice gradatim acuminatis, margine leviter recurvatis, 3-pli-nerviis, nervis secundariis prope basim orientibus apicem folii versus costa conjunctis, costa et nervis secundariis supra leviter impressis subtus elevatis, nervis marginalibus indistinctis et rete venularum immersis vel subtus paullo prominulis; inflorescentiis apicem ramulorum versus axillaribus racemosis 5–8-floris, basi bracteis paucis ovatis acutis circiter 1.5 mm. longis subtentis, rhachi subtereti 1–1.5 mm. diametro 1–2 cm. longa; floribus alternatis basi bracteatis, bracteis papyraceis elongato-deltoides 1.5–2 mm. longis acutis parce glanduloso-marginatis; pedicellis teretibus 8–15 mm. longis apicem versus bibracteolatis (bracteolis ut bracteis sed minoribus), basi gracilibus, distaliter in calycem gradatim incrassatis; calyce obconico limbo incluso 10–15 mm. longo et apice ad 15 mm. diametro, limbo papyraceo erecto-patente lobis inclusis 5–6 mm. longo inconspicue nervato, lobis inconspicuis in cuspidem 0.5–0.8 mm. longam apiculatis margine biglandulosis, glandulis linearibus 0.5–2 mm. longis; corolla carnosa campanulato-cylindrica sub anthesi 40–50 mm. longa, basim versus 10–15 mm. ut videtur apice ad 20 mm. diametro, lobis deltoideis acutis 6–10 mm. longis et latis; staminibus corollam fere subaequantibus; filamentis liberis 6–8 mm. longis, 1–1.5 mm. latis, ubique praeter basim pilis circiter 0.2 mm. longis puberulis; thecis crassis circiter 8 mm. longis basi leviter incurvatis; tubulis gracillimus (basi circiter 0.4 mm. apicem versus circiter 0.25 mm. diametro) 25–30 mm. longis, poris terminalibus vel leviter obliquis dehiscentibus; stylo corollam subaequante gracili truncato.

COLOMBIA: Putumayo: Alta cuenca del río Putumayo, filo de la Cordillera entre El Encano y Sibundoy; páramo de San Antonio del Bordoncillo, alt. 3250 m., 4 Enero 1941, Cuatrecasas 11771 (Col, US no. 1798516, TYPE), frutex de 0.50 m.; corola crasa rosado-anaranjada.

In its distinct and pilose filaments, *S. pulcherrima* resembles *S. Kar-*

steniana Kl., from which it differs in its smaller and fewer-nerved leaf-blades, shorter pedicels, and much larger flowers, especially the larger calyx and broader corolla. From the remaining species of *Semiramisia*, the new species differs in its separate and pilose filaments, as well as in details of foliage, its more complex inflorescence, and the proportions of its calyx and corolla, etc. *Semiramisia pulcherrima* is the first recorded specimen of the genus from Colombia, it having previously been known from the Andes of Venezuela, Ecuador, and Peru.

Ceratostema amplexicaule sp. nov.

Frutex, ramulis gracilibus teretibus molliter et breviter albo-pilosis; foliis sessilibus vel minutissime petiolatis, laminis subcordiaceis ovato-oblongis, 5–7.5 cm. longis, 3–4.5 cm. latis, basi profunde cordatis et amplexicaulibus, apice obtusis, margine leviter recurvatis, utrinque molliter pilosis vel puberulis ut videtur demum glabrescentibus, nervis secundariis utrinsecus circiter 4 basim versus orientibus cum costa supra subimmersis vel prominulis subtus prominentibus, infimis paullo reflexis, summis arcuatim et apicem laminae versus costa obscure conjunctis, rete venularum subimmerso; inflorescentiis racemosis subterminalibus ubique (i.e. rhachi, bracteis bracteolisque, pedicellis, calyce et corolla extus) pilis 0.5–0.8 mm. longis molliter albo-pilosis; rhachi leviter angulata 2.5–4.5 cm. longa 7–13-flora; bracteis sub pedicellis papyraceis deltoideis 2–3 mm. longis et latis acutis intus glabris; pedicellis subteretibus 10–17 mm. longis, cum calyce obscure articulatis, paullo infra medium vel basim versus bibracteolatis, bracteolis suboppositis ut bracteis sed minoribus et obscure pauciglandulos-mARGINATIS; calycis tubo cupuliformi obscure 10-costato sub anthesi circiter 3 mm. longo et 5 mm. diametro, limbo subpatente lobis inclusis circiter 3 mm. longo intus glabro, lobis 5 deltoideis acutis, circiter 2 mm. longis et 4 mm. latis, secus margines praeter apicem versus glandulis linearibus praeditis, sinibus acutis; corolla crasse carnosa urceolato-cylindrica vel juventute leviter angulata, sub anthesi 25–30 mm. longa et basim versus 6–7 mm. diametro, distaliter gradatim angustata, intus glabra, demum profunde 5-lobata, lobis subulatis ad 15 mm. longis et basi 3 mm. latis, apice subacutis; staminibus corollam subaequantibus vel leviter exsertis, filamentis membranaceis glabris mox liberis ligulatis 6–8 mm. longis, thecis valde granulosis 9–10 mm. longis 1–1.5 mm. crassis, tubulis gracillimis circiter 0.2 mm. diametro 13–14 mm. longis basim versus saepe tuberculato-granulosis, poris ovalibus oblique terminalibus circiter 0.7 mm. longis dehiscentibus; stylo corollam subaequante gracili (circiter 0.5 mm. diametro) truncato.

COLOMBIA: Putumayo: Vertiente oriental de la Cordillera, bosques higrófilos entre Mocoa y Sachamates, alt. 600–700 m., 29 Diciembre 1940, Cuatrecasas 11407 (Col, US no. 1798507, TYPE), frútex; corola rojo-anaranjada.

In its subsessile leaf-blades, which are deeply cordate and amplexicaul at base, the new species resembles only *C. peruvianum* Gmel., the remaining species of the genus having leaf-blades cuneate to attenuate at base. In their pubescence, *C. amplexicaule* and *C. peruvianum* are essentially similar. However, the new species differs sharply from *C. peruvianum* in its very small calyx-lobes, those of Gmelin's species being 10–15 mm. long and 6–9 mm. broad. In other respects, also, the flowers of *C. peruvianum* are

substantially larger than those of the new species, the corolla and stamens being about 40 mm. long. Furthermore, the leaf-blades of the new species are more nearly sessile and more obtuse at apex than those of *C. peruvianum*.

The genus *Ceratostema* Juss. (sensu Sleumer in Notizbl. Bot. Gart. Berlin **12**: 278–282. 1935, et A. C. Sm. in Bull. Torrey Bot. Cl. **63**: 307–308. 1936; non sensu falso A. C. Sm. in Contr. U. S. Nat. Herb. **28**: 335–348. 1932) has previously been known only from Ecuador (this being probably true even for *C. peruvianum*, the genotype). It should be noted that the present species falls into the genus *Englerodoxa* Hoer. as treated by me in 1932 (op. cit. 350–352), a synonym of *Ceratostema* Juss., which is now known to contain six species. The numerous other species which have been referred to *Ceratostema* belong to *Pellegrinia*, *Demosthenesia*, *Plutarchia*, etc. (see Sleumer, loc. cit. 1935, and A. C. Sm., loc. cit. 1936).

Psammisia flaviflora sp. nov.

Frutex scandens forsan epiphyticus ubique praeter filaments glaber, ramulis subteretibus gracilibus (apicem versus 2–3 mm. diametro); petiolis crassis (2–3 mm. diametro) semiteretibus 6–12 mm. longis; laminis chartaceis oblongo-ellipticis, 13–20 cm. longis, 4.5–8 cm. latis, basi acutis et in petiolum decurrentibus, apice abrupte caudato-acuminatis (acumine gracili 1–1.5 cm. longo acuto), margine leviter recurvatis, 5- vel 7-pli-nerviis, nervis infimis e basi orientibus summis costa 1–2 cm. concurrentibus, costa nervisque supra paullo elevatis et saepe insculptis subtus prominentibus, rete venularum copioso utrinque prominulo; inflorescentiis ut videtur apicem ramulorum versus axillaribus subfasciculatis vel obscure breviracemosis, rhachi ad 4 mm. longa plerumque breviore; floribus paucis bracteis papyraceis deltoideis circiter 1.5×1.5 mm. subacutis pauciglanduloso-marginatis subtentis; pedicellis rugulosis crassis (1–2 mm. diametro) subcurvatis 15–20 mm. longis paullo supra basim bibracteolatis, bracteolis oppositis bracteis similibus; calyce coriaceo sub anthesi 8–10 mm. longo, tubo cupuliformi 4–6 mm. longo et circiter 7 mm. diametro, limbo erecto-patente lobis inclusis 3–4 mm. longo, lobis deltoideis acutis 2–3 mm. longis et 3–4 mm. latis, sinibus acutis; corolla carnosa subgloboso-urceolata, sub anthesi 7–8 mm. longa et circiter 6 mm. diametro, basim et apicem versus contracta, lobis 5 deltoideis circiter 1.5×1.5 mm. subacutis; staminibus 10, filamentis liberis submembranaceis ligulatis circiter 3.5 mm. longis margine superne ciliolato-puberulis antheras apice thecarum affixis, connectivis brevibus omnibus bicalcaratis (calcaribus subacutis conspicuis saepe antrorsis), antheris circiter 4 mm. longis, thecis valde granulosis circiter 3 mm. longis et 1.3–1.5 mm. crassis, tubulis distinctis gracillimis brevibus (circiter 1 mm. longis) acutis per rimas ovales dehiscentibus; stylo crasso corollam subaequante truncato.

ECUADOR: Guayas (?): Western Cordillera, valley of Río Chimbo, alt. 800 m., Rimbach 67 (A, TYPE), shrub, climbing high among forest trees; peduncle and calyx-tube bright red, the calyx-lobes greenish, the corolla and lobes yellow.

The closest relative of this very distinct new species is the recently described *P. occidentalis* A. C. Sm. (in Am. Jour. Bot. **27**: 542. 1940), from western Colombia. However, *P. flaviflora* has leaf-blades with the secondary nerves oriented nearer the base and more prominent on the upper

surface, while its inflorescence has fewer flowers and a shorter rachis. The flowers of the new species have longer pedicels and are substantially larger throughout, the calyx-lobes being entirely different in shape. Other small-flowered species of *Psammisia* with subfasciculate inflorescences — *P. Pennellii* A. C. Sm. and *P. caudatula* Sleumer — have quite distinct foliage as well as minor differences in floral proportions.

Psammisia ferruginea A. C. Sm. in Contr. U. S. Nat. Herb. **28**: 391. pl. 10. 1932.

COLOMBIA: Putumayo: Vertiente oriental de la Cordillera, entre Sachamates y San Francisco de Sibundoy, Quebrada de Susunga, alt. 1600–1800 m., Cuatrecasas 11447 (Col, US), arbusto de ramas scandens; pedúnculos y cáliz rosado-cárdenos; corola rosada.

This very distinct species has previously been known only from the Departments of El Cauca and Nariño, and therefore the new record is of unusual interest; the type is a Lobb specimen of uncertain origin, but probably from the Pacific slope of Colombia.

Psammisia columbiensis Hoer. in Bot. Jahrb. **42**: 303. 1909; A. C. Sm. in Contr. U. S. Nat. Herb. **28**: 398. 1932.

COLOMBIA: Putumayo: Vertiente oriental de la Cordillera, entre Sachamates y San Francisco de Sibundoy, Quebrada de Susunga, alt. 1600–1800 m., Cuatrecasas 11446 (A, Col), arbustito de ramas péndulas; pedúnculos, cálices y corolas rojos, ápice blanco.

This species has previously been recorded only from the type, collected by Lehmann in the "Central Andes of Popayán," Dept. El Cauca, alt. 2500–2800 m. The present collection agrees with the type in all essential characters, including the connate filaments, but has its leaf-blades slightly broader, 2.5–4.8 cm. broad.

Psammisia Cuatrecasasii sp. nov.

Frutex ramosus ubique praeter filamenta bracteas bracteolasque glaber, ramulis crassis (apicem versus circiter 8 mm. diametro) subteretibus; petiolis crassis (4–5 mm. diametro) circiter 2 cm. longis; laminis coriaceis siccitate olivaceis late ovato-oblongis, 22–27 cm. longis, 12–14 cm. latis, basi rotundatis vel obtusis et in petiolum paullo decurrentibus, apice ut videtur obtuse cuspidatis, margine anguste recurvatis, 7–9-pli-nerviis, nervis infimis e basi orientibus summis costa ad 5 cm. concurrentibus, costa nervisque supra subplanis subtus valde prominentibus, rete venularum subimmerso subtus leviter prominulo; inflorescentiis axillaribus racemosis 6–9-floris, rhachi crassa subtereti circiter 4 cm. longa, pedicellis sub anthesi 25–30 mm. longis, bracteis subcoriaceis oblongis circiter 6 mm. longis et 3 mm. latis apice rotundatis margine obscure ciliolato-puberulis subtentis, paullo supra medium bibracteolatis, bracteolis suboppositis papyraceis deltoideo-oblongis circiter 3×2 mm. acutis margine ciliolato-puberulis et pauciglandulosis; calyce coriaceo late cupuliformi, tubo circiter 2 mm. longo et 5 mm. diametro, limbo patente lobis inclusis 3–4 mm. longo, lobis 5 late ovatis, 2–3 mm. longis, 5–6 mm. latis, apice apiculatis, margine praeter apicem versus glanduloso-incrassatis; corolla carnosa cylindrico-urceolata sub anthesi 21–27 mm. longa, basim versus circiter 7 mm. diametro, supra ad 4 mm. angustata, lobis 5 incrassatis deltoideis subacutis circiter 3×3 mm.; staminibus 10, filamentis liberis subcarnosis ligulatis 6–7 mm. longis margine superne puberulis, connectivis superne alternatum

conspicue bicalcaratis (calcaribus 0.7–1 mm. longis acutis antrorsis), thecis valde granulosis 8–9 mm. longis basi inconspicue tuberculatis, tubulis leviter cohaerentibus circiter 4 mm. longis per rimas ovales 2·3 mm. longas dehiscentibus; stylo filiformi sub anthesi conspicue exserto 25–30 mm. longo truncato.

COLOMBIA: Putumayo: Alta cuenca del río Putumayo en el Valle de Sibundoy extremo E., junto a San Francisco, alt. 2200 m., 1 Enero 1941, Cuatrecasas 11562 (Col., TYPE), arbusto ramoso; pédunculo, cáliz y corola carmín, extremo blanco.

Psammisia Cuatrecasasii is at once distinguished by its large and proportionately broad 7–9-pli-nerved leaf-blades. In foliage it most suggests *P. Ulbrichiana* Hoer., but it has even broader leaves, larger bracts, and larger and much more conspicuously spurred stamens. Perhaps a closer relative of the new species is *P. falcata* (H. B. K.) Kl., a species with leaf-blades only 3.5–7 cm. broad and 5–7-pli-nerved, usually longer inflorescences, and smaller bracts.

***Psammisia aestuans* sp. nov.**

Frutex (?) ubique praeter filamenta glaber, ramulis gracilibus (apicem versus 1 mm. vel minus diametro) subteretibus; petiolis gracilibus leviter canaliculatis 2–5 mm. longis; laminis subcoriaceis in sicco olivaceis vel saepe metallicis ovatis, 3–5 cm. longis, 1.2–2.2 cm. latis, basi rotundatis vel late obtusis, apice acumine gracili attenuato 1·2 cm. longo conspicue praeditis, margine anguste recurvatis, 3- vel 5-pli-nerviis (nervis exterioribus inconspicuis), nervis interioribus e costa ad 5 mm. supra basim orientibus, costa supra leviter impressa subitus cum nervis elevatis, nervis supra saepe prominulis, venulis immersis; inflorescentiis axillaribus breviter racemosis paucifloris (sub anthesi saepe unifloris), rhachi gracili 2–7 mm. longa basim versus minute bracteata, floribus bracteis papyraceis deltoideis acutis circiter 1 mm. longis et latis subtentis; pedicellis subteretibus rugulosis crassis (1.5–2 mm. diametro) circiter 12 mm. longis basim versus minute bibracteolatis, bracteolis suboppositis bracteis similibus; calyce minute ruguloso 7–8 mm. longo et summo diametro, tubo cupuliformi 4–5 mm. longo et diametro, limbo papyraceo erecto-patente lobis minute apiculatis inclusis 3·4 mm. longo, sinibus complanatis; corolla carnosa cylindrico-urceolata sub anthesi 15–17 mm. longa, basim versus 5–7 mm. diametro distaliter gradatim angustata, lobis 5 elongato-deltoides acutis circiter 2 × 1.5 mm.; staminibus 10 corollam fere aequantibus, filamentis submembranaceis liberis ligulatis circiter 2 mm. longis et 1·1.5 mm. latis margine superne minute ciliolatis, connectivis angustis omnibus superne bicalcaratis (calcaribus acutis vel subacutis alternatim conspicuoribus), antheris circiter 13 mm. longis, thecis valde granulosis 5.5–6 mm. longis crassis (circiter 1.5 mm. diametro) basi incurvatis, tubulis liberis gracilibus 7–7.5 mm. longis per rimas ovales 0.7–1 mm. longas dehiscentibus; stylo filiformi corollam subaequante truncato; fructibus immaturis coriaceis subglobosis 7–8 mm. diametro, calycis limbo persistente coronatis.

COLOMBIA: Antioquia: La Ceja, Diciembre 1939, Hermano Daniel 2178 (US no. 1778630, TYPE), corola en el base roja, en el ápice verde.

Psammisia aestuans is so distinct from the other species of *Psammisia* that one places it here with hesitation; yet, on the basis of floral characters, there can be no doubt of its place in the genus. The small, long-acuminate,

few-nerved leaves suggest those of no other species of *Psammisia*, but the flowers are typical for the genus, although the inconspicuous calyx-lobes and the long anther-tubules are unusual.

Plutarchia angulata sp. nov.

Frutex, ramulis subteretibus apicem versus pilis 0.4–0.7 mm. longis dense cinereo-pilosis demum glabrescentibus; petiolis 1–3 mm. longis in-crassatis (1.5–2 mm. diametro) ut ramulis pilosis; laminis subcoriaceis in sicco fusco-olivaceis late ovatis, 2.3–3.5 cm. longis, 2.2–4 cm. latis, basi leviter cordatis, apice obtusis vel subrotundatis, margine anguste recurvatis, supra minute puberulis mox glabris, subtus praecipue costa ut petiolis hispidulo-pilosis demum glabrescentibus, 7- vel 9-pli-nerviis, costa supra leviter impressa subtus elevata, nervis secundariis basim versus orientibus curvatis supra subimmersis subtus prominulis, venuis obscuris vel subtus paullo prominulis; inflorescentiis apicem ramulorum versus axillaribus vel subterminalibus 2–5-floris breviter racemosis, basi bracteis paucis papyraceis ovatis acutis pilosis 2–3 mm. longis circumdati, rhachi subtereti rugulosa 5–25 mm. longa ut ramulis dense pilosa vel puberula; floribus bracteis papyraceis anguste oblongis acuminatis 3–4 mm. longis extus puberulis subtentis; pedicellis subteretibus dense pilosis 8–20 mm. longis basim versus bibracteolatis, bracteolis suboppositis bracteis similibus sed minoribus mox caducis; calyce cum pedicello articulato 12–15 mm. longo extus pilis albidis mollibus circiter 0.3 mm. longis dense piloso demum sub-glabrescente, tubo 4–6 mm. longo basi rotundato alis 4 conspicuis 2–3 mm. latis sinibus oppositis ornato, limbo 8–9 mm. longo erecto intus glabro fere ad basim 4-lobato, lobis subcoriaceis elongato-deltoides basi 5–8 mm. latis forsan accrescentibus ad apicem acutum gradatim angustatis, sinibus acutis; corolla tenuiter carnosa tubulosa 4-angulata, sub anthesi 17–21 mm. longa et 5–6 mm. diametro, extus pilis 0.5–1 mm. longis densissime villosa-velutina, intus glabra, lobis 4 oblongo-deltoides subacutis circiter 2 × 2 mm.; staminibus 8 similibus quam corolla paullo brevioribus, filamentis liberis carnosis glabris ligulatis 2–3 mm. longis, antheris 12–17 mm. longis, thecis minute granulosis 4–7 mm. longis et circiter 1 mm. diametro, tubulis latis flexilibus plerumque quam thecis circiter duplo longioribus per rimas elongatas dehiscentibus; disco inconspicuo glabro; stylo filiformi corollam subaequante, stigmate truncato vel minute subpellato.

COLOMBIA: Putumayo: Alta cuenca del río Putumayo, filo de la Cordillera entre El Encano y Sibundoy; páramo de San Antonio del Bordoncillo, alt. 3250 m., 4 Enero 1941, Cuatrecasas 11733 (Col, US no. 1798515, TYPE), frutex; cáliz y corola rosados.

Although *P. angulata* does not bear a close superficial resemblance to the other species of *Plutarchia*, its staminal characters indicate that it can belong to no other genus. It differs from the other species of the genus in its 4-merous flowers, its winged calyx-tube, and its angled densely pubescent corolla, while its proportionately broad cordate subsessile leaf-blades, which are soft-pilose beneath, are also characteristic. *Plutarchia pubiflora* (Wedd.) A. C. Sm. is perhaps the closest ally of *P. angulata*, but there are numerous obvious differences between the two species.

Cavendishia Cuatrecasasii A. C. Sm. in Rev. Acad. Colomb. Ci. Ex. Fís.-Quím. Nat. 5: 38. 1942.

Since the publication of this well-marked species, two additional collections have come to my attention:

COLOMBIA: Putumayo: Vertiente oriental de la Cordillera, entre Sachamates y San Francisco de Sibundoy, alt. 1600–1750 m., Cuatrecasas 11464 (A, Col, US), arbusto de ramas divaricadas; brácteas y flores rosado cárdenas; Huila-Cauca: Cordillera Oriental sobre el filo divisorio, en Gabinete, alt. 2300–2450 m., Cuatrecasas 8479 (Col, US), gran frútex; brácteas rosadas; cáliz muy largo, rosado; corola, base y ápice blanco rosado, tercio superior roja.

These specimens make desirable a slight amplification of the original description, as follows: petioles up to 15 mm. long; leaf-blades up to 18 cm. long and 9 cm. broad; corolla often only 22 mm. long, the stamens proportionately shorter than those originally described. These slight variations are no more than individual.

Cavendishia speciosa sp. nov.

Frutex ad 5 m. altus ubique praeter filamenta glaber, ramulis teretibus gracilibus (apicem versus 2–3 mm. diametro); petiolis subteretibus rugosis incrassatis (2–3 mm. diametro) 5–8 mm. longis; laminis coriaceis in sicco fuscis anguste oblongis, 8–14 cm. longis, 2–3.6 cm. latis, basi obtusis, apice caudato-acuminatis (acumine gracili 10–15 mm. longo), margine anguste et basim versus conspicue revolutis, 3-pli-nerviis, nervis paullo supra basim orientibus adscendentibus costa apicem versus inconspicue conjunctis, costa nervisque supra impressis subtus valde elevatis, nervis marginalibus interdum visis sed immersis, rete venularum immerso; inflorescentia axillari vel subterminali multiflora, rhachi crassa (4–6 mm. diametro) basi florum 30–40 incrassata; bracteis sub floribus membranaceis copiose reticulato-venosis obovato-oblongis, 30–40 mm. longis, 18–30 mm. latis, apice rotundatis vel conspicue bilobatis, dorso glandulas minutis subglobosas sessiles saepe copiose gerentibus; pedicellis teretibus crassis 6–7 mm. longis ut videtur ebracteolatis (bracteolis non visis forsitan mox caducis); calyce 11–12 mm. longo, tubo breviter cylindrico 3–4 mm. longo et circiter 4.5 mm. diametro, limbo submembranaceo erecto lobis inclusis 7–8 mm. longo, lobis deltoideis acutis circiter 2 mm. longis et 3.5 mm. latis glandulas plures albas sessiles margine gerentibus, sinibus rotundatis; corolla tenuiter carnosa cylindrica, sub anthesi circiter 30 mm. longa et basim versus 5–6 mm. diametro, distaliter angustata, lobis 5 oblongis subacutis circiter 2 × 1.5 mm.; staminibus quam corolla multo brevioribus, filamentis ligulatis alternatim circiter 4 mm. et 7–8 mm. longis superne angustatis intus et margine distaliter pilosis, antheris alternatim circiter 11 mm. et 10 mm. longis, thecis 4–5 mm. longis, tubulis quam thecis paullo longioribus per rimas elongatas ovales dehiscentibus; stylo filiformi corollam subaequante, stigmate minute peltato.

COLOMBIA: Antioquia: Between Valdivia and Yarumal, alt. 2000 m., moist canyon, Feb. 20, 1942, Metcalf & Cuatrecasas 30101 (A, TYPE, US), shrub 4–5 m. high; bracts vivid red, with brown glands; calyx white; corolla white and rose.

This beautiful and spectacular species is one of the most distinct in *Cavendishia*, being characterized by its thick 3-nerved leaf-blades, its membranaceous reticulate-veined bracts, its elongate glandular-margined calyx-limb, and its large showy corollas. Its closest relative is doubtless *C. Kalbreyeri* Mansf., also from Antioquia, from which it differs in its more elongate inflorescence with more numerous flowers, its larger and

thinner bracts, its calyx with glandular rather than thick-margined lobes, its larger corollas, and its shorter and differently proportioned anthers, those of *C. Kalbreyeri* having tubules much longer than the thecae.

***Cavendishia rosea* sp. nov.**

Frutex ad 5 m. altus ubique praeter filamenta glaber, ramulis subteretibus apicem versus 3–4 mm. diametro; petiolis inconspicuis incrassatis 2–5 mm. longis; laminis subcoriaceis siccitate olivaceis ovato-oblongis, 6–9 cm. longis, 2.5–4.3 cm. latis, basi conspicue cordatis, apice obtuse cuspidatis, margine leviter recurvatis, 5–7-pli-nerviis, nervis infimis patentibus debilibus, nervis superioribus costa ad 2 cm. concurrentibus vel e basi orientibus, costa nervisque supra prominulis vel subplanis subtus prominentibus, rete venularum utrinque paullo prominulo, venulis brevibus e costa saepe patentibus; inflorescentia apicem ramulorum versus axillari racemosa 20–30-flora, rhachi angulata 1.5–2.5 mm. diametro 8–9 cm. longa basi pedicellorum incrassata; floribus bracteis papyraceis oblongis 25–32 mm. longis et 8–12 mm. latis acutis conspicue punctatis subtentis; pedicellis teretibus 10–14 mm. longis basim versus decidue bibracteolatis, bracteolis papyraceis elliptico-oblongis, 4–6.5 mm. longis, 2–3 mm. latis, apice rotundatis et minute apiculatis; calyce breviter cylindrico leviter 5-angulato sub anthesi circiter 5 mm. longo, tubo 4–5 mm. diametro, limbo erecto papyraceo lobis inclusis 2–3 mm. longo, lobis saepe incurvatis late deltoideis subacutis circiter 1 mm. longis et 2.5 mm. latis, sinibus rotundatis; corolla subcarnosa cylindrica, sub anthesi 16–17 mm. longa et 4–5 mm. diametro, apice paullo angustata, lobis deltoideis subacutis circiter 0.7×1.5 mm.; staminibus corollam fere aequantibus alternatim leviter inaequalibus, filamentis submembranaceis ligulatis intus parce puberulis alternatim 2–2.5 mm. et 5–6 mm. longis, antheris alternatim 11–12 mm. et 10–11 mm. longis, thecis 3–4 mm. longis, tubulis quam thecis plus minusve duplo longioribus per rimas elongatas dehiscentibus; stylo filiformi corollam subaequante, stigmate minute subpellato.

COLOMBIA: Antioquia: Between Valdivia and Yarumal, alt. 2200 m., shaded hillside, Feb. 20, 1942, Metcalf & Cuatrecasas 30123 (A, TYPE, US), shrub 4–5 m. high; stems red-streaked; leaves green with red margins and reddish tinge above; bracts red; corolla rose-red; maturing calyx greenish yellow.

The new species is related only to *C. subamplexicaulis* A. C. Sm., also from northwestern Colombia, with which it has in common an elongate inflorescence and cordate-based leaf-blades. However, *C. rosea* differs from its ally in its proportionately narrower leaf-blades, which are less obviously clasping at base, have fewer and more prominent secondary nerves, and are cuspidate rather than obtuse at apex. The rachis of the new species is more slender, and the bracts and corollas are slightly larger; the anther-proportions are different from those of *C. subamplexicaulis*, in which the thecae and tubules are nearly equal in length. These two closely related species appear to have no other immediate allies.

***Cavendishia Dugandiana* sp. nov.**

Frutex ad 6 m. altus, ramulis fusco-cinereis apicem versus gracilibus et cinereo-puberulis; petiolis subteretibus puberulis 2–4 mm. longis; laminis parvis coriaceis in sicco olivaceis anguste oblongis, 2–4 cm. longis, 0.8–1.4 cm. latis, basi rotundatis vel obscure subcordatis, apice obtusis et saepe

minute mucronulatis, margine subplanis, supra inconspicue scabridis et parce brunneo-glandulosis, subtus pilos minutos brunneos dispersos gerentibus et interdum secus nervos basim versus puberulis, 3- vel obscure 5-plinerviis, nervis secundariis prope basim orientibus et costa supra leviter impressis subtus elevatis, rete venularum immerso; inflorescentia apicem ramulorum versus axillari breviter racemosa 2-4-flora, basi bracteis pluribus imbricatis submembranaceis extus glanduloso-pilosis (pilis brunneis vel albis circiter 0.2 mm. longis) glabrescentibus instructa, bracteis interioribus maximis oblongis ad 2 cm. longis et 0.8 cm. latis apice rotundatis vel leviter emarginatis; rhachi glabra leviter angulata sub anthesi ad 8 mm. longa, floribus bracteis eis basi rhachis similibus subtentis; pedicellis puberulis et parce albo-glandulosis, 2-3.5 mm. longis, basim versus univel bibracteolatis, bracteolis linearibus circiter 3 mm. longis et 0.4 mm. latis conspicue albo-glanduloso-marginatis; floribus extus albo-puberulis; calyce 5-6 mm. longo, tubo cupuliformi sub anthesi circiter 3 × 3 mm., limbo suberecto intus glabro lobis inclusis 2-3 mm. longo, lobis 5 deltoideis acutis, 1-1.5 mm. longis, circiter 2 mm. latis, margine glandulas albas lineares patenter gerentibus, sinibus rotundatis; corolla tenuiter carnosa intus glabra cylindrica, sub anthesi 10-12 mm. longa et 4-5 mm. lata, apice paullo contracta, lobis deltoideis acutis circiter 1 × 1.5 mm.; staminibus 10 quam corolla paullo brevioribus, filamentis membranaceis alternatim circiter 1.5 mm. et 4 mm. longis margine puberulo-ciliolatis apice angustatis, antheris alternatim circiter 9 mm. et 8 mm. longis, tubulis quam thecis paullo longioribus per rimas elongatas dehiscentibus; stylo filiformi corollam subaequante subtruncato.

COLOMBIA: Antioquia: Between Yarumal and Medellín, alt. 2700 m., near stream-bed on páramo, Feb. 20, 1942, Metcalf & Cuatrecasas 30159 (A, TYPE, US), shrub 4-6 m. high; bracts light rose-colored; calyx green, with silvery hairs; corolla red, green-tipped.

Cavendishia Dugandiana is characterized by its small leaves, pilose flowers, and linear glandular-margined bracteoles. Its closest relatives appear to be *C. Killipii* A. C. Sm. and *C. scabriuscula* (H. B. K.) Hoer., from both of which it is distinguished by its smaller and fewer-nerved leaf-blades, fewer-flowered inflorescences, shorter pedicels, smaller flowers, calyx-lobes with linear glands, etc.

It is a pleasure to dedicate this species to Dr. Armando Dugand G., Director of the Instituto Botanico, Universidad Nacional de Colombia, in recognition of his valuable work on the flora of Colombia.

Satyria arborea sp. nov.

Arbor ad 12 m. alta ubique praeter inflorescentiam glabra, ramulis crassis subteretibus cinereis; petiolis rugosis valde incrassatis (2.5-3 mm. diametro) 3-5 mm. longis; laminis coriaceis elliptico-oblongis, 11-12 cm. longis, 3.3-4 cm. latis, basi gradatim acutis, apice obtusis, margine valde recurvatis, 5-pli-nerviis, nervis interioribus e costa 2.5-4 cm. supra basim orientibus, nervis omnibus adscendentibus cum costa supra valde impressis (costa basim versus elevata) subtus prominentibus, rete venularum immerso; inflorescentiis cum floribus ubique molliter albo-pilosis vel puberulis (pilis 0.1-0.25 mm. longis), copiosis, in axillis foliorum mox delapsorum dispositis, racemosis, 10-25-floris; rhachi leviter angulata gracili 5-20 mm. longa basim versus interdum ramosa, basi bracteis pluribus imbricatis

papyraceis ovatis acutis pauciglanduloso-marginatis 1–2 mm. longis et latis ornata; floribus bracteis oblongis acuminatis circiter 1.5 × 0.7 mm. subtentis; pedicellis gracilibus sub anthesi 13–18 mm. longis basim versus bibracteolatis; calycis tubo cupuliformi 1.5–2 mm. longo et circiter 3 mm. diametro, limbo papyraceo intus glabro subpatente lobis inclusis 1–1.5 mm. longo, lobis 5 inconspicuis apiculatis, sinibus complanatis; corolla tenuiter carnosa intus glabra cylindrico-urceolata, sub anthesi 8–11 mm. longa et basim versus 2–3 mm. diametro, lobis 5 deltoideis subacutis circiter 0.5 × 1 mm.; staminibus quam corolla multo brevioribus, filamentis glabris in tubo membranaceo 2.5–3 mm. longo connatis, antheris alternatim circiter 3 mm. et 3.5–4 mm. longis, tubulis thecas subaequantibus per rimas latas ovales dehiscentibus; stylo filiformi corollam subaequante, stigmate minute peltato.

COLOMBIA: Antioquia: Between Valdivia and Yarumal, alt. 2200 m., along roadside in partial shade, Feb. 20, 1942, Metcalf & Cuatrecasas 30131 (A, type, US), tree 10–12 m. high; calyx and corolla rose-colored, finely white-pilose, the corolla white distally.

Satyria arborea is apparently most closely allied to the recently described *S. Allenii* A. C. Sm. from Panama (in Ann. Mo. Bot. Gard. 28: 451. 1941), from which it differs in its arborescent rather than epiphytic habit, shorter petioles, slightly larger leaf-blades with more highly connate secondary nerves, longer and more copiously flowered inflorescences, longer pedicels, and longer anthers (these being about twice as long in *S. arborea* than in *S. Allenii*). Another relative of the new species is *S. breviflora* Hoer., but the two plants differ in many details of foliage and inflorescence; the flowers of *S. breviflora* are larger throughout and are glabrous, at least at anthesis, while those of *S. arborea* are persistently puberulent.

Themistoclesia epiphytica sp. nov.

Frutex epiphyticus scandens vel dependens, ramulis gracilibus subteretibus juventute copiose brunneo-hispidis demum glabrescentibus; petiolis subteretibus 1–3 mm. longis ut ramulis hispidis glabrescentibus; laminis primo papyraceis demum coriaceis ovatis, 17–28 mm. longis, 8–14 mm. latis, basi obtusis vel subrotundatis, apice acumine gracili subulato 3–7 mm. longo terminatis, margine anguste recurvatis vel subrevolutis, juventute utrinque parce hispidulis mox glabrescentibus, inconspicue 3- vel 5-plinerviis, costa supra impressa subtus valde elevata, nervis secundariis basim versus orientibus obscuris subtus leviter prominulis vel immersis, rete venularum immerso; inflorescentia axillari vel e ramulis defoliatis oriente breviter racemosa 4–7-flora (floribus raro ad 1 reductis), rhachi pedicellisque plus minusve hispidulis; rhachi gracili plerumque 3–5 mm. longa, basi bracteis pluribus papyraceis oblongis acutis circiter 2 mm. longis circundata; floribus bracteis anguste oblongis circiter 1.5 mm. longis apice hispidulis subtentis; pedicellis gracilibus 6–13 mm. longis medium versus bibracteolatis, bracteolis ut bracteis sed minoribus margine hispidulis; calyce 5–6 mm. longo extus pilis 0.15–1 mm. longis plus minusve dense hispidulo etiam interdum sparse brunneo-glanduloso, tubo obconico leviter 5-angulato 3.5–4.5 mm. longo 2.5–3 mm. diametro, limbo papyraceo erectopatente lobis inclusis circiter 1.5 mm. longo, lobis 5 apiculatis 0.3–0.7 mm. longis, sinibus complanatis; disco pulvinato minute vel conspicue hispido (pilis ad 0.5 mm. longis); corolla tenuiter carnosa praeter lobos parce

hispidulos glabra, 9–10 mm. longa, 4–5 mm. diametro, lobis 5 deltoideis subacutis circiter 1×1.5 mm.; staminibus quam corolla paullo brevioribus, filamentis glabris membranaceis filiformi-ligulatis alternatim circiter 3 mm. et 4 mm. longis, antheris 5–5.5 mm. longis, thecis 1.5–2 mm. longis, tubulis quam thecis fere duplo longioribus per rimas ovales 0.7–1 mm. longas dehiscentibus; stylo filiformi corollam subaequante truncata.

COLOMBIA: Nariño: Páramo del Tábano, alto de la Cordillera, entre Pasto y El Encano, vertiente occidental, alt. 3200 m., 11 Enero 1941, Cuatrecasas 11899 (A, TYPE, Col), frútex epífito, ramoso péndulo; corola vermellón; Putumayo: Alta cuenca del río Putumayo, filo de la Cordillera entre El Encano y Sibundoy; páramo de San Antonio del Bordocillo, alt. 3250 m., Cuatrecasas 11725 (Col, US), frútex epífito scandens; corola vermellón.

The genus *Themistoclesia*, which in 1932 (in Contr. U. S. Nat. Herb. **28**: 439–444) I supposed to consist of only six species, has since been greatly expanded; in the most recent treatment (Sleumer in Bot. Jahrb. **71**: 389–393, 1941) 17 species are recognized. *Themistoclesia epiphytica* is characterized by its epiphytic habit, proportionately long calyx-tube, and long filaments. It is probably most closely related to *T. Pennellii* (A. C. Sm.) Sleumer, from which it differs in its larger and acuminate leaf-blades, longer pedicels, slightly larger calyx and corolla, unequal filaments, and somewhat smaller and differently proportioned anthers. *Themistoclesia peruviana* A. C. Sm., another ally of the new species, differs in its more persistently hispid habit, short pedicels, short filaments, differently proportioned anthers, etc.

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THE COMPARATIVE MORPHOLOGY OF THE WINTERACEAE II. CARPELS

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With six plates

INTRODUCTION

IN a previous paper, Bailey and Smith (1) called attention to the remarkable stamens and carpel of *Degeneria*, suggesting that they might prove to be of considerable significance in interpreting the floral morphology of the Ranales. In this genus of the monotypic family Degeneriaceae, both the stamens and the carpel appear to be primitive, palmately 3-veined sporophylls of but slightly modified form. The lamina of the megasporophyll is adaxially folded or conduplicate and bears numerous ovules on its morphological upper surface. In other words, the ovules are not attached to the margins of a classical, involute, sealed sporophyll, but to the ventral surface of the megasporophyll as in certain of the Pteridospermae.

Carpels of a fundamentally similar type occur in the *Tasmannia* section of *Drimys* and in certain species of *Bubbia*. Other representatives of the Winteraceae exhibit various trends of specialization in the modification of these primitive ranalian megasporophylls. The numerous species of the six genera of the family provide abundant material for comparative studies and demonstrate that the salient trends of specialization in the megasporophylls of the Winteraceae are unlike those which characterize the Magnoliaceae and the Himantandraceae (Bailey, Nast, and Smith, 2).

MATERIAL AND METHODS

The herbarium specimens upon which our floral studies are based have been listed in Dr. Smith's papers (3, 4, 5) and need not be relisted here. The vascularization of carpels and other floral organs is commonly reconstructed by the laborious study of serial sections. We have found, however, that such investigations may be facilitated and much accelerated by carefully controlled clearing of flowers or parts of flowers. In the case of material from herbarium specimens, the following procedure is helpful and widely applicable to both flowers and leaves. The dry flowers or leaves are first heated in water until thoroughly saturated and freed of air. They are then transferred to a dilute aqueous solution of NaOH and placed in sealed bottles in an incubator at 55° C. until cleared to the desired degree. They are next washed free of NaOH and transferred to vials of 95% alcohol for visual study. Permanent mounts can be made by passing the material through absolute alcohol, diaphane solvent to diaphane or through absolute alcohol, toluene to clarite. The clarity of the vascularization depends upon the refractive index of the medium and the consistency of the tissues.

Commonly the venation shows best in alcohol, and the unmounted specimens may be turned for examination at all angles. Staining of the material is unnecessary either for visual examination or for photomicrography. The method is adequate except in cases where organs are excessively hairy or where they contain numerous clusters of sclereids, as in the floral parts of certain species of *Bubbia*, *Exospermum*, and *Zygogynum*. In dealing with such material, one is forced to rely largely upon serial sections.

CARPELS OF THE TASMANNIA SECTION OF DRIMYS

There is a conspicuous tendency in many ranalian families for the leaves to be adaxially folded or conduplicate during the earlier stages of their ontogenetic development. In such species of the *Tasmannia* section of *Drimys* as *D. piperita* Hook. f., the carpels resemble in external form these conduplicate young leaves. There is a similar differentiation of the megasporophylls into stipe (petiole), *Fig. 1*, and conduplicate lamina, compare *Figs. 1* and *12*. The more or less closely approximated ventral surfaces¹ of the conduplicate megasporophyll frequently are not extensively and firmly concrescent prior to and during anthesis. Thus, the conduplicate lamina may be spread open without serious or extensive rupture and distortion of the carpel or of its constituent tissues, *Fig. 17*.

The carpels are vascularized by three veins, a median vein and two lateral veins. The median vein frequently bifurcates and has numerous conspicuous branches of considerable length, *Fig. 17*. The two lateral veins commonly have short branches that are directed both outward toward the margins of the megasporophyll and inward toward the branches of the median vein, *Figs. 1* and *3* and left half of *Fig. 17*. In certain cases, the lateral veins have extensive branches that run parallel to them, right half of *Fig. 17*. The ovules are remote from the margins of the megasporophyll and are invariably attached between the median and the lateral veins, i.e. in the parts of the carpel where the branches of the median and lateral vascular systems tend to overlap and anastomose. The ovules are vascularized in part by extensions of the veinlets of the lateral systems (*a* in *Figs. 17* and *18*), in part by extensions of the veinlets of the median system (*b* in *Figs. 17* and *18*), and in part by strands arising from anastomosed

¹In order to avoid confusion in morphological descriptions, it is essential to recognize that the terms ventral and dorsal are used in two distinct ways, (1) in referring to the upper and lower *surfaces* of flat, clarified appendages, and (2) in designating *parts* or sides of folded megasporophylls, viz. carpels. There are ontogenetic and phylogenetic implications in both usages.

We shall refer to the upper or morphologically adaxial surface of leaves and sporophylls as ventral, to the lower or morphologically abaxial surface as dorsal. In conduplicate ranalian carpels, the exposed outer surfaces are, therefore, dorsal and the internal ones ventral.

In dealing with conduplicate ranalian carpels, we shall refer to the primitively abaxial part of the sporophyll (the part vascularized by the median vein) as dorsal, to the primitively adaxial parts (those vascularized by the lateral veins) as ventral. In unmodified conduplicate carpels, the ventral parts are adaxially oriented, *Fig. 1*, whereas in certain specialized forms, *Figs. 20–23*, their actual orientation may be in part terminal or even abaxial.

branches of the median and lateral systems (*c* in *Figs.* 17 and 18). The details of the vascularization, both of the carpels and of the ovules, fluctuate considerably from carpel to carpel of the same species and of the same flower. Thus, the ovules may be vascularized at times largely by the median system, by the lateral systems, or by varying combinations of these systems.

As shown in *Fig. 12*, the free margins of the conduplicate megasporophylls are provided with conspicuous, glandular-appearing, papillate cells or hairs, which extend backward from the margins for varying distances over the exposed dorsal surfaces of the conduplicate megasporophylls. That the papillae are glandular and function as a stigmatic surface is demonstrated by adhering pollen at anthesis, *Fig. 2*, and by pollen-tubes which penetrate the mat of papillae. Thus, the carpels are provided with extensive stigmatic crests (actually double), which extend from the region of the stipe along the conduplicate adaxial parts of the sporophyll and slightly overtop its apex, *Figs. 1* and *2*.

The fertile carpels have a fundamentally similar conduplicate form, placentation, and vascularization throughout the 15 species of the *Tasmannia* section of *Drimys* that we have studied. There are variations in the length of the stipe, in the size and form of the conduplicate lamina, in the extension of the outer stigmatic surfaces, in the concrescence of the approximated ventral surfaces, in the number and form of the ovules, and in the details of the vascularization, but only in two of the investigated species are the deviations of considerable magnitude. The carpels of *D. stipitata* Vickery are characterized by their excessively elongated stipe; those of *D. lanceolata* (Poir.) Baill. by their unusually fleshy conduplicate lamina of nearly globular form, *Fig. 27*.

The sterile megasporophylls of staminate flowers usually are smaller, but they have a similar conduplicate, palmately 3-veined lamina, *Fig. 2*. Although no ovules are formed, the stigmatic surfaces are conspicuously developed and are encrusted with firmly adherent pollen at anthesis, *Fig. 2*. In the more rudimentary forms of sterile carpels, the branches of the median and lateral veins may be feebly developed or absent, thus resembling the venation of fertile carpels during the earlier stages of their ontogeny.

CARPELS OF THE WINTERA SECTION OF DRIMYS

In the *Tasmannia* section of *Drimys*, the carpels are adaxially folded or conduplicate and may be spread open into megasporophylls of but slightly modified form. When unfolded, *Fig. 17*, their venation resembles that of a palmately 3-veined appendage. The elongated locule of the folded carpel is oriented approximately parallel to the long axis of the megasporophyll, and the numerous ovules are attached to two placental ridges that are situated between the median and lateral veins.

The carpels throughout the *Wintera* section of *Drimys* have a fundamentally similar vascularization and placentation, but the external stigmatic surfaces are restricted to the adaxially projecting, subapical, ventral part of the carpels, *Fig. 6*. The approximated ventral surfaces of the conduplici-

cate carpels are firmly concrecent, *Fig. 14*, except at the level of the stigmatic projection, *Fig. 13*, and therefore the megasporophylls cannot be unfolded as in the case of the more primitive sporophylls of the *Tasmannia* type. At the level of the stigmatic projection, *Fig. 13*, there is a cleft-like opening or a loose suture which extends outward from the locule as in *Drimys piperita*, *Fig. 12*, of the *Tasmannia* section of *Drimys*. Serial transverse sections indicate that the closure of the carpels progressed upward from the base and downward from the apex of the conduplicate lamina, and commonly also centripetally, since vestiges of the cleft-like opening tend to persist internally, *Fig. 14*, after they have been completely eliminated externally. These conclusions regarding closure may be verified by the serial sectioning of *Tasmannia* type carpels, many of which exhibit incipient stages of concrecence. With the closure of the cleft-like opening, the carpels retract, and eventually eliminate, the stigmatic crests from the sealed parts of the megasporophylls. Thus, the subapical projection of the *Wintera* type of carpel is not to be interpreted as a style-like outgrowth, but rather as a persistent remnant of the extensive adaxial stigmatic crests of *Tasmannia* type megasporophylls, *Fig. 19*.

CARPELS OF BUBBIA, BELLIOLUM, EXOSPERMUM, AND ZYGOGYNUM

Various transitional stages in the closure of conduplicate carpels and in the restriction of their stigmatic crests occur in the genus *Bubbia*, but in this genus, as in *Belliolum*, *Exospermum*, and *Zygogynum*, there is in addition a more or less pronounced abaxially directed deformation of the conduplicate megasporophylls.

The carpels of *Bubbia Archboldiana* A. C. Sm. (*Brass* 12712) resemble those of the *Tasmannia* section of *Drimys* in their vascularization, placentation, and in having extensive stigmatic surfaces, *Fig. 20*. They differ in their angular external form and in their conspicuously broadened and flattened apices. There are, however, no significant modifications in the longitudinal orientation of the locule, the placental ridges, or the median and lateral veins. The carpel of *Bubbia megacarpa* A. C. Sm. (*Brass* 10249) likewise has extensive stigmatic margins, *Fig. 21*, but it exhibits a profoundly modified form, due to the overtopping of the shortened dorsal side of the sporophyll by its over-extended, conduplicate, ventral side. In other words, there is an abaxially directed deformation of the megasporophyll which produces a short, apically much broadened carpel. The locule, the placental ridges, the lateral veins, and the stigmatic crests all show pronounced abaxial curvatures. Owing to these concomitant deformations from longitudinal to approximately transverse orientations, it is evident that the apparently terminal parts of the carpel, *Fig. 21*, actually are homologues of the ventral parts of the primitive carpels illustrated in *Fig. 1*. The true apex of the carpel is curved around onto the dorsal side of the megasporophyll. The massive median trace dissociates in the base of the carpel, *Fig. 21*, into numerous vascular strands, the majority of which extend upward toward the transversely oriented parts of the placental ridges. Their recurved ends either terminate in the placental ridges or

anastomose with the short downwardly directed branches of the lateral veins. Comparatively few branches of the median vein are directed diagonally toward the longitudinally oriented basal parts of the placental ridges. Most of the ovules are vascularized by veinlets of the lateral systems.

The carpels of other species of *Bubbia*, as of *Belliolum* and *Zygogynum*, exhibit more or less conspicuous abaxially directed deformations and, in addition, much restricted stigmatic crests which tend to assume a transversely terminal orientation. Although the carpels of *Bubbia longifolia* A. C. Sm. (*Brass* 13868) have less exaggerated abaxial deformation, *Figs.* 10 and 22, and therefore a less modified median vein than that of *B. megacarpa*, *Fig.* 21, the stigmatic crests and the ovules are restricted to the diagonal upper part of the distorted megasporophylls. The approximated ventral surfaces in the lower ventral part of the conduplicate carpel are concrescent and there is no cleft-like opening extending outward from the locule except in the upper part of the megasporophyll which subtends the stigmatic crests. The placental ridges and ovules are likewise restricted to the upper part of the sporophyll. The ovules are vascularized in part by veinlets of the lateral systems and in part by extensions of the median system, *Fig.* 22. The single, terminal megasporophyll of *Bubbia monocarpa* A. C. Sm. (*Kanehira & Hatusima* 12105), *Fig.* 9, resembles the carpels of *B. longifolia* both in its abaxial deformation and its internal structure. It demonstrates, as does the single terminal carpel of *B. megacarpa*, that the distorted forms of the megasporophylls in polycarpellate species are not due solely to excessive compression of adjacent organs during ontogenetic development. The immature carpels, illustrated in *Figs.* 7 and 8, indicate furthermore that the abaxial deformations are of phylogenetic rather than purely ontogenetic development.

In *Bubbia Clemensiae* A. C. Sm. (*Clemens* 5157 and 4596), abaxial deformation coupled with concomitant modifications of the lower part of the megasporophylls have produced a more nearly symmetrical carpel, *Fig.* 23. Externally it is difficult to distinguish the sealed, crestless, adaxial side of the conduplicate sporophyll from its dorsal side. Furthermore, the lateral veins not infrequently are fused in the lower closed part of the carpel and separate at a higher level, thus simulating the bifurcation of the median vein. The transversely oriented placental ridges extend downward into the locule for a considerable distance, *Fig.* 15. Therefore, the attachment of the ovules is more remote from the stigmatic margins and the ovules are vascularized by more downwardly extended veinlets of the lateral and median systems.

The carpels of *Bubbia Whiteana* A. C. Sm. (*Brass* 2278), *Figs.* 11 and 24, resemble the megasporophylls of *B. Clemensiae* in their concealed abaxial deformation and in their much modified median and lateral vascular systems, but differ from them in having less extensive terminal stigmatic crests and ovules that are attached at a higher level of the locule. The ovules, as in *B. Clemensiae*, are vascularized by extensions of both the lateral and median systems.

Restriction of the stigmatic crests is carried to an extreme in the short, terminally broadened, fleshy carpels of *Bubbia auriculata* v. Tiegh. (*Vieillard* 2280) and *B. semecarpoides* (F. v. Muell.) Burtt (*Kajewski* 1216). There is a pronounced abaxially directed deformation in the ventral part of the conduplicate carpel, as indicated by the curvature of the lateral veins and the diagonal orientation of the placental ridges, *Fig. 25*, but the conduplicate ventral part of the carpel does not extend across the broad terminal face of the megasporophyll and does not overtop a shortened dorsal side as in *B. megacarpa*, *Fig. 21*, or *B. Clemensiae*, *Fig. 23*.

In most species of *Bubbia*, as in the *Tasmannia* section of *Drimys*, the placental ridges are closely correlated in orientation and extension with the stigmatic crests. In certain carpels, however, e.g. those of *B. pachyantha* A. C. Sm. (*Brass* 4371) and *B. isoneura* v. Tiegh. (*Vieillard* 17), there are more or less conspicuous unconformities, as in the megasporophylls of the *Wintera* section of *Drimys*, *Fig. 19*. In other words, the placental ridges persist for varying distances in the sealed, crestless, ventral part of the megasporophylls. Such unconformities between the orientation and extension of the placental ridges and the stigmatic crests occur at times in the carpels of *Belliolum*, *Fig. 26*. Although the carpels of *Belliolum* in general resemble those of the more highly specialized species of *Bubbia* (viz. those having more or less restricted, terminally oriented crests), the attachment of the ovules tends to be at lower levels and the branches of the lateral veins are more downwardly extended, as in *Bubbia Clemensiae*, *Fig. 23*.

The coriaceous megasporophylls of certain polycarpellate species of *Bubbia*, e.g. *B. pachyantha*, are closely crowded and firmly coherent both preceding and during anthesis. Thus, as stated by Smith (3), "the gynaeicum has the appearance of a compound ovary with a 3- or 4-parted stellate stigma." Such gynaecia closely resemble that of *Exospermum stipitatum* (Baill.) v. Tiegh. (*Vieillard* 2281). There is, accordingly, no such sharply defined morphological distinction between coherent (*Exospermum*) and free (*Bubbia*) carpels as hypothesized by van Tieghem (6). The individual carpels may be readily separated after clearing treatments and each is provided with an independent epidermal layer. Only in the gynaecia of *Zygogynum* are the carpels fused into a concrecent mass without internal evidences of sutures, *Fig. 16*.

The ovules of *Exospermum stipitatum* are not restricted in their attachment to conspicuous stigmatic ridges, but are scattered over the walls of the locule, a modified type of placentation that is suggestive of certain Nymphaeaceae and Lardizabalaceae. The cleft-like opening at anthesis is partly closed externally and does not extend outward from the locule to the stigmatic surface as in *Zygogynum spathulatum* v. Tiegh. (*Vieillard* 2266), *Fig. 16*. In this, as in other species of *Zygogynum*, the shortened placental ridges, *Fig. 16*, are situated on the abaxial side of the locule. The ovules are not attached to the dorsal part of the carpel, however, as hypothesized by van Tieghem (6), but to a morphologically ventral part of the conduplicate megasporophylls that has been deflected into an

abaxial orientation and thus overtops the much shortened morphologically dorsal part of the carpel.

The carpels of *Pseudowintera* fluctuate considerably in form. In general, those of *P. axillaris* var. *colorata* (Raoul) A. C. Sm., Fig. 4, tend to resemble the megasporophylls of the *Wintera* section of *Drimys*, whereas those of *P. axillaris* var. *typica* A. C. Sm., Fig. 5, exhibit more pronounced abaxially directed deformation as in certain species of *Bubbia*.

SIGNIFICANCE OF INTERNAL PAPILLATE SURFACES

The conduplicate megasporophylls of *Degeneria* (Bailey and Smith, 1) have more or less conspicuously flaring free margins and are characterized by having short, glandular-appearing hairs that are distributed inwardly from the margins along the approximated ventral surfaces as far as the flanks of the placental ridges. Thus, the cleft-like opening that extends outward from the locule is partly occluded by interlocking papillae, and pollen does not have direct access to the locule in most cases. The pollen grains become attached to the outer glandular projections and the pollen-tubes penetrate apparently through the mat of interlocking papillae.

In the Winteraceae, the free margins of the conduplicate lamina (in unsealed parts of the carpels) are more closely approximated and the stigmatic papillae extend backward from the margins over the exposed dorsal surfaces of the sporophylls, Figs. 12 and 13. There are, in addition, more or less numerous papillate cells along the ventral surfaces of the conduplicate megasporophylls, Figs. 12 and 13. These projecting cells commonly jacket both flanks of the placental ridges even in sealed parts of the carpels, Fig. 14. In regions of incipient closure (phylogenetic, not ontogenetic) the papillae not infrequently appear to enlarge and to interlock and possibly at times to play an initial role in the developing suture.

Unfortunately, herbarium specimens do not provide adequate material for studying the finer cytological and histological details of the closure of carpels or of the penetration of pollen-tubes. Such details can be clarified only by the study of living and adequately killed and fixed material. Furthermore, it is essential that the carpels of *Degeneria* and the Winteraceae be studied in all stages of their ontogenetic development and during the changes that they undergo subsequent to anthesis.

It should be emphasized in this connection that there is considerable variation in the form of winteraceous carpels, in the details of their vascularization, in the extent of their closure, etc., not only in material from different collections of the same species, but also in different carpels from the same flower. Therefore, our descriptions and illustrations represent average or typical conditions. Numerous variations in the structural details of particular genera and species may be anticipated when more abundant and complete collections of these remarkable plants become available.

DISCUSSION AND CONCLUSIONS

The carpels of the *Tasmannia* section of *Drimys* are conduplicate megasporophylls of but slightly modified form and closely resemble the mega-

sporophyll of *Degeneria*. In both cases, the megasporophyll is clearly differentiated into stipe and adaxially folded lamina, *Figs. 1 and 2*. When spread open, the lamina exhibits a palmately 3-veined vascularization such as characterizes both the microsporophylls and the sterile sporophylls (staminodes) of the Degeneriaceae and Himantandraceae. The numerous anatropous ovules, *Fig. 18*, are attached to more or less conspicuous placental ridges that are situated between the median and the lateral veins, *Fig. 17*. The ovules are vascularized in part by short branches of the two lateral veins, in part by branches of the median vein, and in part by strands originating near anastomoses of the lateral and median vascular systems, the ratios of the three types of vascularization fluctuating from carpel to carpel. The conduplicate form, placentation, and vascularization of the megasporophyll do not conform with the classical interpretation of the angiosperm carpel as an involute megasporophyll bearing marginally attached ovules. In the Winteraceae and Degeneriaceae, the ovules are borne on the morphological upper surface of the megasporophyll, *between the lateral and median veins*, *Fig. 17*, and remote from the margins of the sporophyll, *Figs. 12, 13, 15, and 16*. It should be noted in this connection that the broad, palmately 3-veined microsporophylls of the Degeneriaceae and Himantandraceae are not differentiated into filament, anther, and connective, and that they bear four slender elongated sporangia that are immersed beneath the dorsal surface of the sporophyll, *midway between the median and the lateral veins*. Thus, in these primitive ranalian carpels and stamens, neither the megasporangia nor the microsporangia are borne upon the margins of the sporophylls. It should be noted, in addition, that there is no conclusive evidence at present for inferring marginal attachments in ancestral angiosperms rather than ventral and dorsal ones as in certain of the Pteridospermae.

In the Winteraceae, the chief trends of specialization of the primitive ranalian megasporophyll lead toward closure of the conduplicate sporophyll (by concrescence of its approximated ventral surfaces) and concomitant restriction of its external stigmatic surfaces. In *Bubbia*, *Belliolum*, *Exospermum*, and *Zygogynum* these trends of specialization are complicated by more or less pronounced abaxially directed deformation which results in an apically much broadened carpel bearing more or less terminally or even abaxially (*Zygogynum*) oriented stigmatic crests. In the more specialized forms, the ovules tend to be attached to transversely or even abaxially oriented placental ridges in the upper part of the carpel.

On the contrary, in the Himantandraceae and Magnoliaceae (the closest relatives of the Degeneriaceae) the specializations of the primitive ranalian megasporophyll lead toward a pronounced constriction of the upper part of the conduplicate lamina. This constricted, sterilized, upper part, viz. style, has more or less extensively "decurrent" stigmatic surfaces and still exhibits a conduplicate structure. The few remaining ovules are thus confined to the fertile, lower, broader part of the conduplicate carpels, which may remain partly open (Himantandraceae) or be firmly sealed (Magnoliaceae).

Our detailed investigations of the numerous representatives of the Winteraceae support the suggestion (Bailey and Smith, 1) that the remarkable megasporophyll of *Degeneria* may afford significant clues for interpreting the diverse carpillary structures of the Ranales. The occurrence of fundamentally similar types of conduplicate megasporophylls throughout the *Tasmannia* section of *Drimys* provides a broad basis for comparative investigations of the various ranalian families. If the dicotyledons are monophyletic, the megasporophylls of the Degeneriaceae and Winteraceae should prove to be equally significant in studying the carpillary specializations of other orders.

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2. ———, C. G. NAST, and A. C. SMITH. The family Himantandraceae. *Jour. Arnold Arb.* **24**: 190-206. *pl. 1-6.* 1943.
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4. ———. The American species of *Drimys*. *Jour. Arnold Arb.* **24**: 1-33. *f. 1-3.* 1943.
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6. TIEGHEM, P. VAN. Sur les dicotylédones du groupe des Homoxylées. *Jour. de Bot.* **14**: 259-297, 330-361. 1900.

EXPLANATION OF PLATES

PLATE I

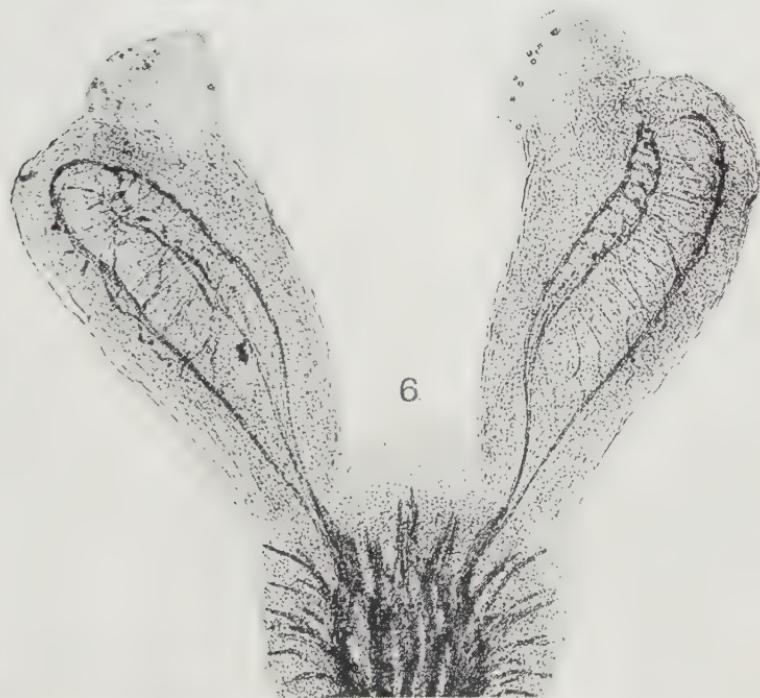
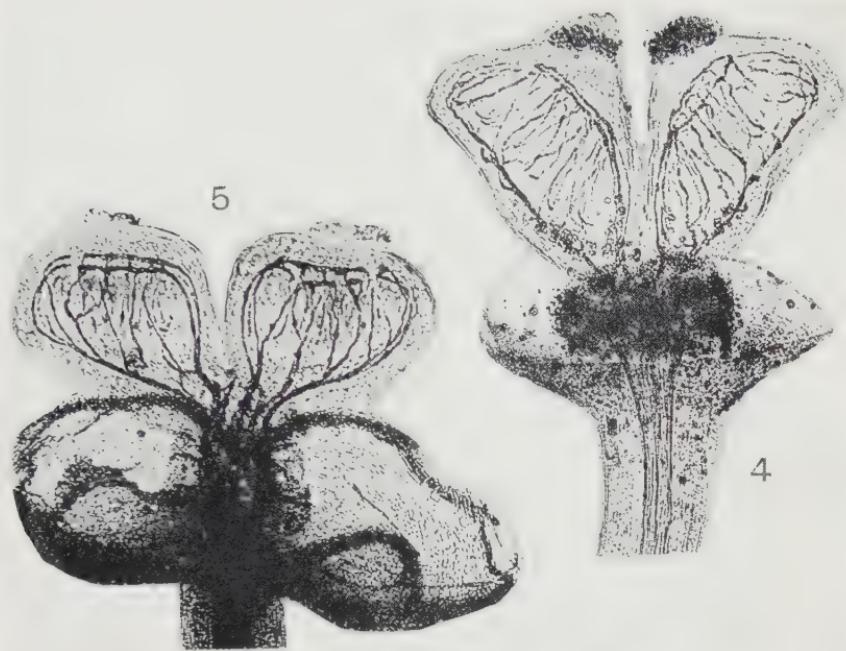
Carpels cleared in dilute NaOH and photographed unstained in 95% alcohol. FIG. 1. *Drimys piperita* Hook. f., *Ramos and Edaño* 38897. Two attached carpels, showing stipe and venation of conduplicate lamina, $\times 20$. FIG. 2. *Drimys macrantha* A. C. Sm., *Brass* 4519. Detached sterile carpel, showing at right pollen attached to stigmatic surface, $\times 24$. FIG. 3. *Drimys insipida* (R. Br.) Pilger, *Caley*. Detached young fruit, showing at left outwardly projecting branches of lateral vein, $\times 17$.

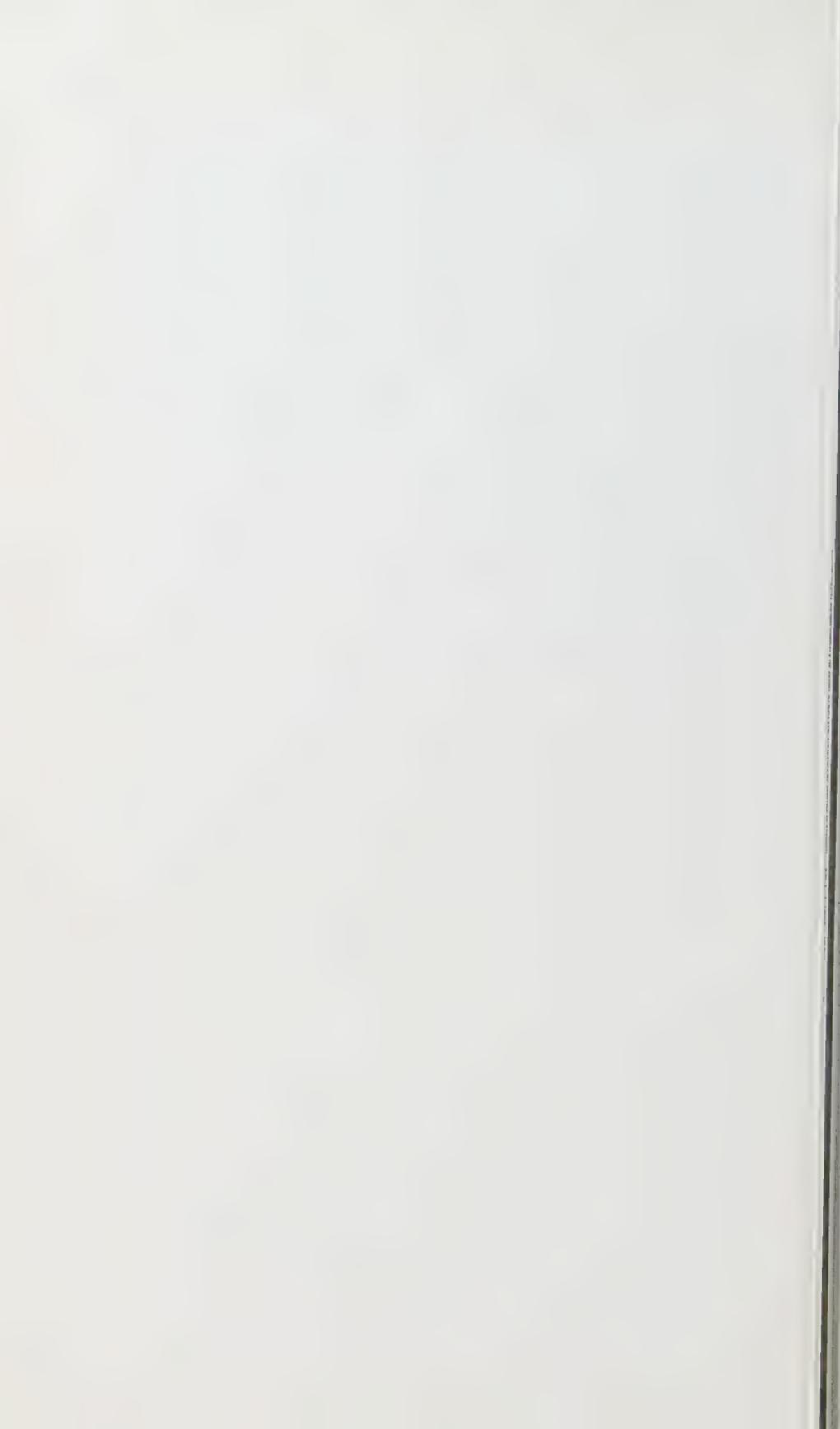
PLATE II

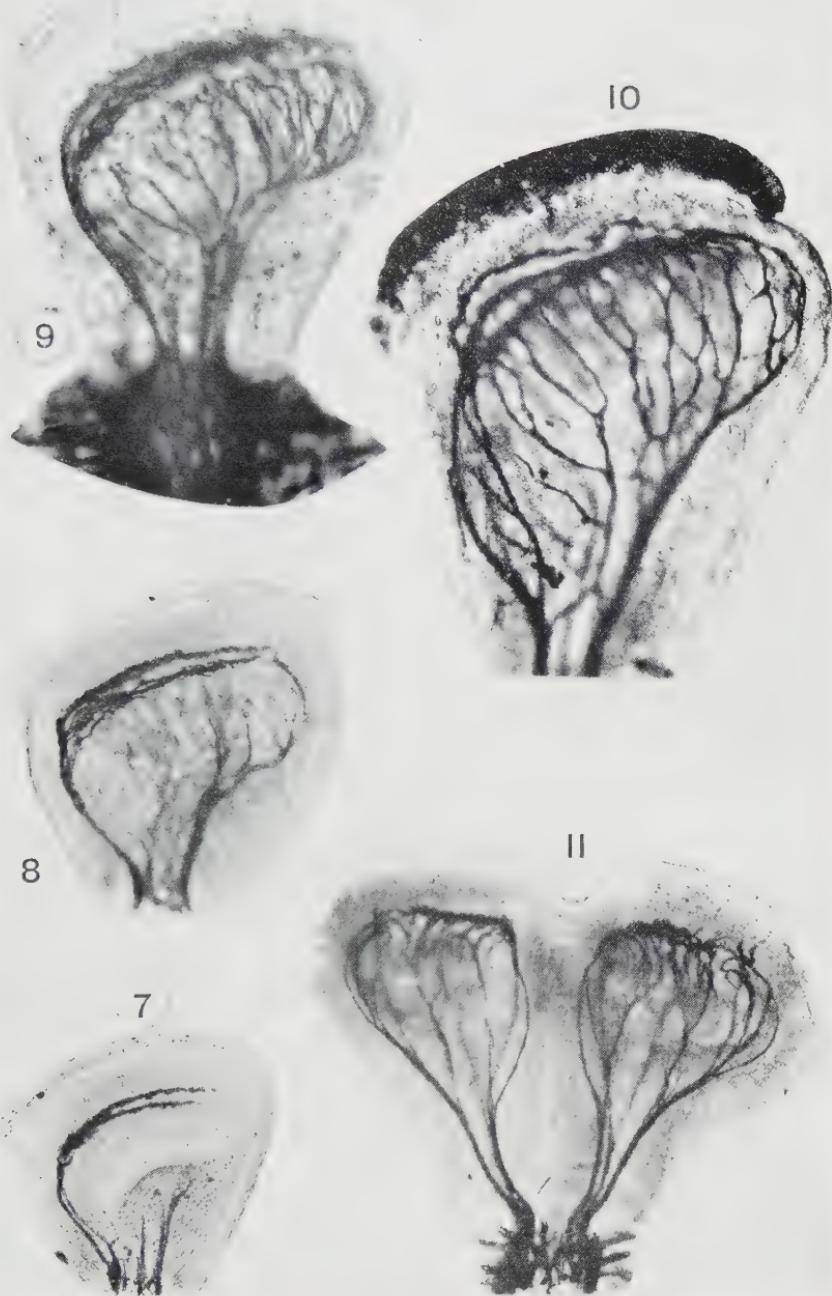
Carpels cleared in dilute NaOH and mounted unstained in diaphane. FIG. 4. *Pseudowintera axillaris* var. *colorata* (Raoul) A. C. Sm., *Kirk*. Two attached carpels, showing lateral view of vascularization, $\times 24$. FIG. 5. *Pseudowintera axillaris* var. *typica* A. C. Sm., *Oliver*. Two attached carpels, showing lateral view of vascularization, $\times 20$. FIG. 6. *Drimys confertifolia* Phil., *Moseley*. Two attached carpels, showing vascularization and apex of torus, $\times 20$.

PLATE III

Carpels cleared in dilute NaOH and photographed unstained in 95% alcohol. FIG. 7. *Bubbia monocarpa* A. C. Sm., *Kanehira and Hatusima* 12105. Young carpel, showing early stage in the development of median and lateral veins, $\times 24$. FIG. 8. *The same*. Somewhat older carpel, showing extensions of the vascularization, $\times 24$. FIG. 9. *The same*. Carpel showing vascularization at anthesis, $\times 24$. FIG. 10. *Bubbia longifolia* A. C. Sm., *Brass* 13868. Mature detached carpel, showing vascularization, $\times 24$. FIG. 11. *Bubbia Whiteana* A. C. Sm., *Brass* 2278. Two somewhat coherent carpels, showing vascularization, $\times 17$.

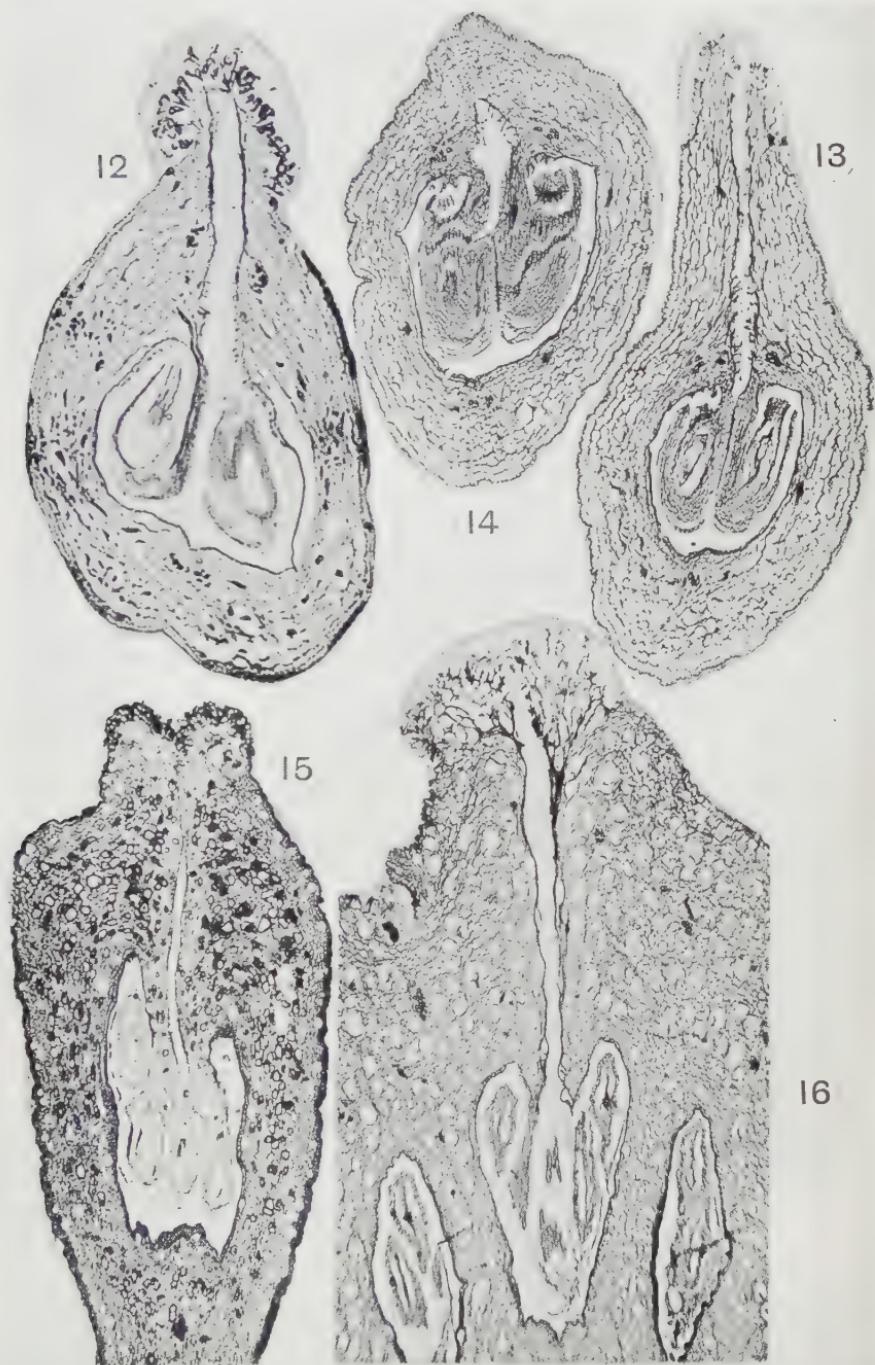






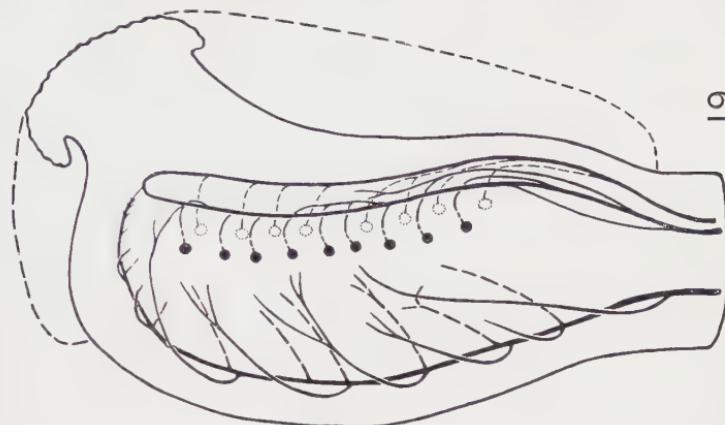
COMPARATIVE MORPHOLOGY OF THE WINTERACEAE



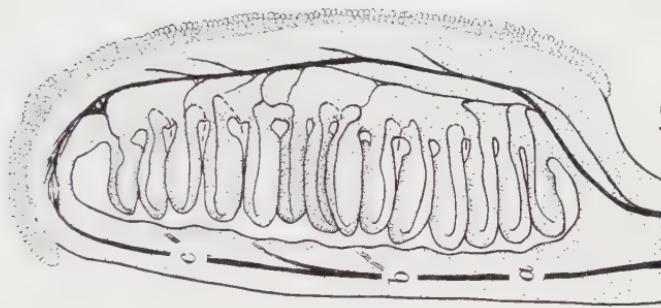




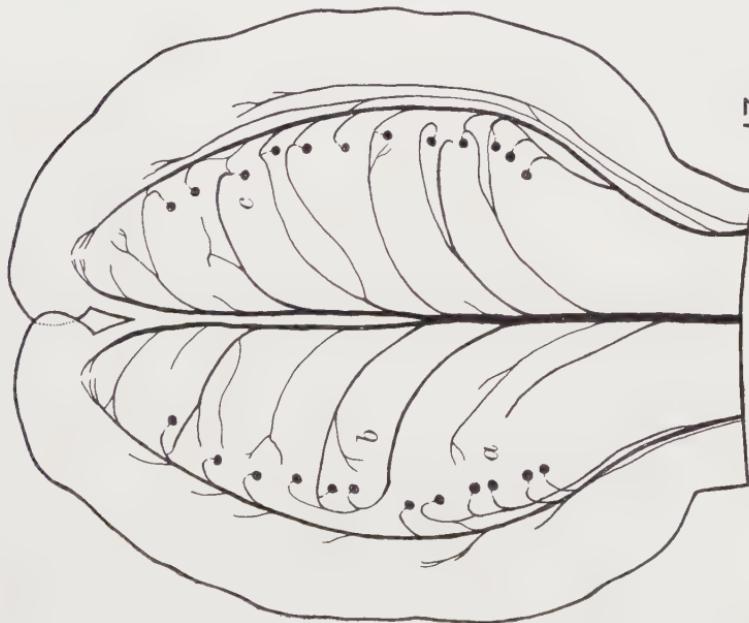
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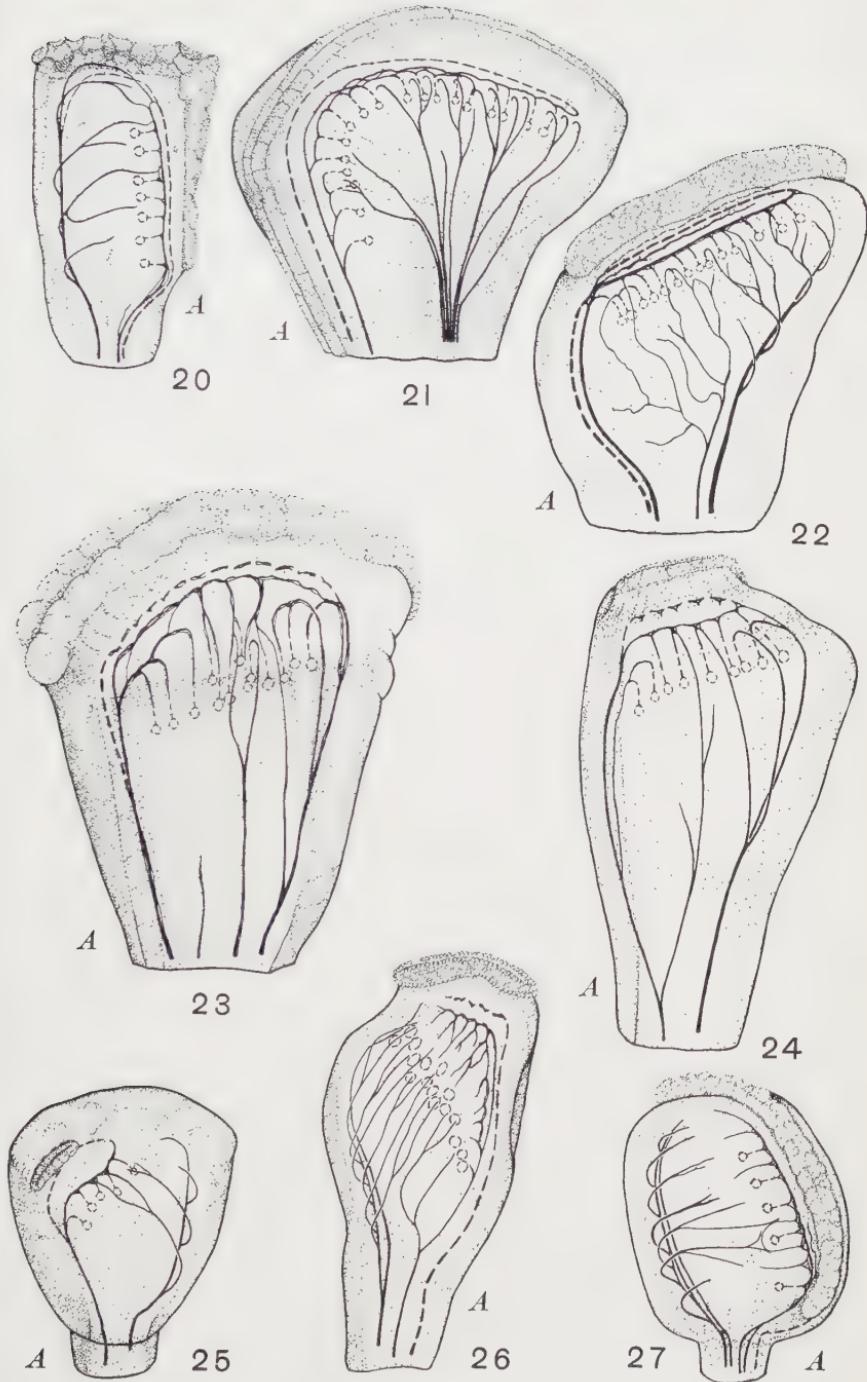
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COMPARATIVE MORPHOLOGY OF THE WINTERACEAE



PLATE IV

Sections of partly re-expanded carpels, stained in Haidenhain's haematoxylin and safranin. FIG. 12. *Drimys piperita* Hook. f., *Ramos and Edaño* 38897. Transverse section of conduplicate carpel, showing stigmatic surfaces and ovules, $\times 50$. FIG. 13. *Drimys granadensis* var. *mexicana* (DC.) A. C. Sm., *Tonduz* 7342. Transverse section of conduplicate, open, upper part of carpel, showing stigmatic surfaces and attachment of ovules, $\times 50$. FIG. 14. *The same*. Lower sealed part of carpel, showing internal vestige of cleft and internal papillae, $\times 50$. FIG. 15. *Bubbia Clemensiae* A. C. Sm., *Clemens* 4596. Longitudinal section, showing cleft-like opening, downwardly projecting stigmatic ridges, and ovules, $\times 24$. FIG. 16. *Zygogynum spathulatum* v. Tiegh., *Vieillard* 2266. Transverse section of gynaecium, showing parts of three con crescent carpels, $\times 40$.

PLATE V

FIG. 17. Composite diagram of opened *Tasmannia* type carpels, showing typical palmately 3-veined vascularizations. Black dots show the approximate position of the micropyles of the elongated anatropous ovules (compare Fig. 18). *a*. ovules vascularized by the lateral system; *b*. ovules vascularized by the median system; *c*. ovules vascularized by strands from anastomosed branches of the median and lateral systems. FIG. 18. Internal view of one half of a *Tasmannia* type carpel, showing form, orientation, and attachment of the anatropous ovules, *a*, *b*, and *c* as in Fig. 17. FIG. 19. Form, placentation, and vascularization of a cleared *Wintera* type carpel, showing restriction of the stigmatic crests to a subapical projection. Broken lines indicate the extent of the stigmatic crests in primitive *Tasmannia* type carpels.

PLATE VI

Diagrams of cleared carpels, showing the extent and orientation of the stigmatic crests and the details of vascularization and placentation in half of each conduplicate megasporophyll. Circles represent the approximate position of the micropyles of the anatropous ovules. The vascular strands of the ovules are represented by solid lines in placental tissue and by broken lines as they enter the funicles. *A*. adaxial side of carpel. Magnification $\times 18$. FIG. 20. *Bubbia Archboldiana* A. C. Sm., *Brass* 12712. FIG. 21. *Bubbia megacarpa* A. C. Sm., *Brass* 10249. FIG. 22. *Bubbia longifolia* A. C. Sm., *Brass* 13868. FIG. 23. *Bubbia Clemensiae* A. C. Sm., *Clemens* 4596. FIG. 24. *Bubbia Whiteana* A. C. Sm., *Brass* 2278. FIG. 25. *Bubbia auriculata* v. Tiegh., *Vieillard* 2280. FIG. 26. *Belliolum haplopus* (Burtt) A. C. Sm., *Brass* 2959. Immature carpel with incomplete vascularization. FIG. 27. *Drimys lanceolata* (Poir.) Baill., *Boorman*.

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FORSYTHIA VAHL, NOMEN GENERICUM CONSERVANDUM

ALFRED REHDER

THE fact that *Forsythia* Vahl needs conservation, on account of the older homonym *Forsythia* Walter of 1788, seems so far to have been overlooked; at least, no proposal for its conservation has been put forward, which is probably not strange, since up to 1930 there was no necessity to conserve the name, because Walter's name is a clear synonym of the older *Decumaria* L. (1762) and the so-called homonym rule (*Internat. Rules Bot. Nomencl.* ed. 3, p. 19, Art. 61, 1935) was not adopted until 1930.

There can be no doubt that the name should be conserved, for the genus contains some of the best known ornamental shrubs brightening in early spring the gardens in temperate America and Europe, and the name is well known in botanical and horticultural and even general literature. Though not a large genus, containing only six or seven species, it includes a considerable number of named varieties of spontaneous as well as garden origin, the latter partly hybrids. The name will certainly be accepted by a large majority as a *nomen conservandum*, when proposed for conservation at the next International Botanical Congress. It seems, therefore, advisable to make herewith a formal proposal which should prevent the taking up the next oldest name, *Rangium* Jussieu, by some author, and the creation of a number of new combinations which can with certainty be expected to be relegated to synonymy by the next Botanical Congress. So far, only one author, namely Ohwi in 1932, seems to have taken up Jussieu's name and made a number of combinations.

Forsythia Vahl, *Enum. Pl.* **1:** 39 (1805)

versus

Forsythia Walter, *Fl. Carol.* 154 (1788).

Rangium Jussieu in *Dict. Sci. Nat.* **24:** 200 (1822).

Type species: *F. suspensa* (Thunb.) Vahl (*Ligustrum suspensum* Thunberg).

Forsythia Vahl has been accepted by all later authors up to 1932, when Ohwi (in *Act. Phytotax. Geobot.* **1:** 140) took up *Rangium*.

Forsythia Walter has not been accepted by any author and has always been treated as a synonym of *Decumaria* Linnaeus (*Sp. Pl. ed. 2,* 1663. 1762).

Rangium Jussieu, based on the monotypic *Forsythia* Vahl, remained without specific epithet until Ohwi (l. c.), in 1932, took up the name and made the following combinations:

Rangium suspensum (Thunb.) Ohwi, l. c. = ***Forsythia suspensa*** Vahl, l. c.

Rangium viridissimum (Lindl.) Ohwi, l. c. = ***Forsythia viridissima*** Lindl. in *Jour. Hort. Soc. Lond.* **1:** 226 (1846).

Rangium koreanum [Rehd.] Ohwi, l. c. = ***Forsythia viridissima*** var. ***koreana*** Rehder in *Jour. Arnold Arb.* **5:** 134 (1924). — Syn.: *F. koreana* (Rehd.) Nakai in *Bot. Mag. Tokyo*, **40:** 471 (1926).

Rangium ovatum (Nakai) Ohwi, l. c. = **Forsythia ovata** Nakai in Bot. Mag. Tokyo, **31**: 104 (1917).
Rangium japonicum (Mak.) Ohwi, l. c. = **Forsythia japonica** Makino in Bot. Mag. Tokyo, **28**: 105, fig. 4 (1914).

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ROYLE'S "ILLUSTRATIONS OF THE BOTANY OF THE HIMALAYAN MOUNTAINS"

WILLIAM T. STEARN

THE "Illustrations of the Botany and other Branches of the Natural History of the Himalayan Mountains, and of the Flora of Cashmere" (2 vols. quarto; London) by John Forbes Royle (1799–1858) stands with Roxburgh's "Plants of the Coast of Coromandel" (1795–1819), Wallich's "Plantae Asiaticae rariores" (1830–1832), Wight's "Icones Plantarum Indiae Orientalis" (1838–1853),¹ and Wight's "Illustrations of Indian Botany" (1840–1850) as one of the most important illustrated works on the flora of India. Royle was a pioneer economic botanist. His work is not so much a descriptive systematic flora as an attempt to reveal "the immense resources of British India, both as regards whatever is necessary for the Agriculture, Manufactures, and Internal trade of the people, as for the supply of a much extended External Commerce." In it "the Geographical Distribution of Plants, as connected with Climate, is considered, their Useful Properties detailed, and the principles which should guide their culture in new situations deduced." Medicinal plants receive special attention. Many new species came to light during the preparation of the work and are concisely described in its pages. It was issued in eleven parts, costing £1. each, between 1833 and 1840. An unnumbered page of the Introduction states the text-content of each part and its date of issue but gives no information about the plates. This is an omission of some importance. The plates illustrate in colour many of the new species described in the text; they sometimes appeared before the corresponding descriptions and, because they contain figures of floral dissections, the valid publication of certain botanical names dates not from the text but from the earlier issued plates.² As Dr. T. A. Sprague remarks, the most satisfactory way to determine the details of issue of a work of this kind is to examine a copy still in the original wrappers. No such copy of Royle's work being known, he endeavoured to ascertain the issue of the plates by a survey of contemporary journals. Notices in Loudon's Gardeners' Magazine, vols. 9–16 (London, 1833–1840), enabled him to fix with precision the issue of 30 out of a total 100 plates. He assumed that the remaining 70 plates were issued in numerical sequence. Since the publication of

¹For dates of publication of Wight's "Icones" see Merrill in Jour. Arnold Arb. **22**: 222–224. 1941.

²In this respect Royle's "Illustrations" is by no means unique. Webb and Berthelot's "Histoire naturelle des Iles Canaries" (1835–1850) is another important work in which a number of names were first published on the plates; for fuller details see Stearn in Jour. Soc. Bibl. Nat. Hist. **1**: 58–59. 1937.

Sprague's paper ("The Dates of Publication of Royle's Illustrations," in *Kew Bull.* **1933**: 378–390. 1933), parts 1–10 in wrappers as issued have come into the present writer's hands. They show that *the plates were not issued in numerical sequence*. This find necessitates some modification, fortunately not extensive, of Sprague's account.

The *contents and dates of publication of the parts* are as follows:

- Part I. (Sept. 1833): pp. 1–40; pls. 4, 11–18, 22.
- Part II. (March, 1834): pp. v–xii, 41–72; pls. 1, 19–21, 23–28.
- Part III. (June, 1834): pp. xiii–xx, 73–104; pls. 2, 5, 29, 31–35, 37, 38.
- Part IV. (Sept. 1834): pp. 105–136; pls. 30, 39, 40, 42, 44–46, 64, 76 as 75 (*Primula*), 78.
- Part V. (Jan. 1835): pp. 137–176; pls. 3, 41, 48–51, 57, 62, 63, 74.
- Part VI. (April, 1835): pp. 177–216; pls. 7, 36, 43, 55, 56, 58, 60, 61, 75 as 75a (*Phlomis*, *Salvia*), and View of the Himalayan Mountains (Frontispiece to Vol. 1).
- Part VII. (Aug. 1835): pp. 217–248; pls. 8, 9, 47, 52, 59, 65, 67–69, 71, 77.
- Part VIII. (Dec. 1835): pp. 249–288; pls. 53, 54, 66, 70, 72, 73, 79 (63a), 80, 87, 88.
- Part IX. (May, 1836): pp. 289–336; pls. 10, 81, 82, 83 (*Procris*), 84–86, 90, 100 (83, *Putranjiva*).
- Part X. (Feb. 1839): pp. 337–384; pls. 89, 91–96, 98 (84a), 99 (78a), and Plan of the H.E.I.C. Botanic Garden at Saharunpore (Frontispiece to Vol. 2).
- Part XI. (1840, before July): pp. xxi–lxxx, 385–472, title-pages, dedications, preface, synoptic table of contents, list of plates, list of plants figured; pls. 6, 97 [details of this part obtained from Loudon, *Gard. Mag.* **16**: 348. 1840 (July), Sprague in *Kew Bull.* **1933**: 382. 1933].

Hence the *dates of the publication of the plates and the parts* in which they were contained are as follows:

Plate 1 (II, March, 1834), 2 (III, June, 1834), 3 (V, Jan. 1835), 4 (I, Sept. 1833), 5 (III, June, 1834), 6 (XI, 1840), 7 (VI, April, 1835), 8–9 (VII, Aug. 1835), 10 (IX, May, 1836), 11–18 (I, Sept. 1833), 19–21 (II, March, 1834), 22 (I, Sept. 1833), 23–28 (II, March, 1834), 29 (III, June, 1834), 30 (IV, Sept. 1834), 31–35 (III, June, 1834), 36 (VI, April, 1835), 37–38 (III, June, 1834), 39–40 (IV, Sept. 1834), 41 (V, Jan. 1835), 42 (IV, Sept. 1834), 43 (VI, April, 1835), 44–46 (IV, Sept. 1834), 47 (VII, Aug. 1835), 48–51 (V, Jan. 1835), 52 (VII, Aug. 1835), 53–54 (VIII, Dec. 1835), 55–56 (VI, April, 1835), 57 (V, Jan. 1835), 58 (VI, April, 1835), 59 (VII, Aug. 1835), 60–61 (VI, April, 1835), 62–63 (V, Jan. 1835), 64 (IV, Sept. 1834), 65 (VII, Aug. 1835), 66 (VIII, Dec. 1835), 67–69 (VII, Aug. 1835), 70 (VIII, Dec. 1835), 71 (VII, Aug. 1835), 72–73 (VIII, Dec. 1835), 74 (V, Jan. 1835), 75 as 75a (VI, April, 1835), 76 as 75 (IV, Sept. 1834), 77 (VII, Aug. 1835), 78 (IV, Sept. 1834), 79–80 (VIII, Dec. 1835), 81–86 (IX, May, 1836), 87–88 (VIII, Dec. 1835), 89 (X, Feb. 1839), 90 (IX, May, 1836), 91–96 (X, Feb. 1839), 97 (XI, 1840), 98 as 84a, 99 (X, Feb. 1839), 100 as 83 (IX, May, 1836).

The *dates of publication of Royle's new species* can be readily ascertained from the above. As Sprague points out, the new species figured by Royle "fall into two categories: (1) those with figures accompanied by analyses, which date from the publication of the plate, where this is earlier than the corresponding text; (2) those without analyses, which date from the publication of the description (if any) in the text." Of the dates which Sprague gives for the 134 new species figured by Royle, only 24 need amendment. The following are corrected citations for these:

Aplotaxis gnaphaloides DC. ex Royle, t. 59, sine anal. (Aug. 1835), p. 251, nomen (Dec. 1835); DC. Prodr. 6: 542 (Jan. 1837),³ as *A. gnaphalodes*.

Astragalus Grahamianus Royle, p. 199, t. 36 (April, 1835).

Campanula cashmeriana Royle, t. 62 (Jan. 1835), pp. 253-254 (Dec. 1835).

Cerasus cornuta Wall. ex Royle, t. 38 (June, 1834), pp. 205, 207 (April, 1835).

Chaptalia gossypina Royle, p. 18, nomen (Sept. 1833), p. 246, t. 59 (Aug. 1835), pp. 250, 251 (Dec. 1835).

Circaeae cordata Royle, p. 211, t. 43 (April, 1835).

Codonopsis rotundifolia Royle, t. 62 (Jan. 1835), pp. 253-254 (Dec. 1835).

Cucumis pseudo-Colocynthis Royle, pp. 218, 220, t. 47 (Aug. 1835).

Cyanathus lobatus Royle, t. 69 (Aug. 1835), p. 309 (May, 1836).

Dendrobium alpestre Lindley ex Royle, pp. 362, 365, t. 88 (Dec. 1835), p. 370 (Feb. 1839), non Swartz (1799).

Deutzia corymbosa R. Brown ex Royle, t. 46 (Sept. 1834), p. 216 (April, 1835).

Gaultheria trichophylla Royle, t. 63 (Jan. 1835), pp. 257-260 (Dec. 1835).

Holostemma Brunonianum Royle, p. 276, nomen, t. 66, sine anal. (Dec. 1835), Decaisne in DC. Prodr. 8: 533 (March, 1844).

Kohautia coccinea Royle, p. 241 (Aug. 1835), t. 53 (Dec. 1835).

Lonicera bracteata Royle, pp. 236-237 (Aug. 1835), t. 53 (Dec. 1835).

Osmorrhiza laxa Royle, p. 233, t. 52 (Aug. 1835).

Picrorhiza Kurroa Bentham in Royle, t. 71 (Aug. 1835), p. 291 (May, 1836); Bentham, Scroph. Ind. p. 47 (? Aug. 1835).

Primula elliptica Royle, t. 76 as t. 75 (Sept. 1834), pp. 310, 311 (May, 1836).

Primula rosea Royle, t. 76 as t. 75 (Sept. 1834), p. 311 (May, 1836).

Prinsepia utilis Royle, t. 38 (June, 1834), pp. 202, 206 (April, 1835).

Rheum spiciforme Royle, p. 37, nomen (Sept. 1833), t. 78 (Sept. 1834), pp. 315, 316, 318 (May, 1836).

Roscoea alpina Royle, p. 19, nomen (Sept. 1833), pp. 357, 361, t. 89 (Feb. 1839).

Roscoea lutea Royle, p. 361, t. 89, "named *R. spicata* in plate, by inadvertence" (Feb. 1839).

"*Roscoea purpurea*" Royle, pp. 357, 361, t. 89 (Feb. 1839), non Smith (1806).

Plate 92 exists in three states. One has the name *Lilium Thomsonianum* in lithographed lettering (e.g. at Royal Botanic Gardens, Kew; Arnold Arboretum). Another has the name *Fritillaria Thomsoniana* instead, the word *Fritillaria* and the final *a* of *Thomsoniana* being handwritten but *Thomsonian* lithographed (e.g. at Lindley Library of Royal Horticultural Society; Linnean Society of London; British Museum, Bloomsbury; British Museum [Natural History], S. Kensington; University Library, Cambridge, England; Royal Botanic Garden, Edinburgh; Bodleian Library, Oxford). A third state has the name *Fritillaria Thomsoniana* lithographed throughout and the letters more evenly spaced than in the second state (e.g. at British Museum [Natural History]; Botany School, Cambridge, England; Cornell University). This plate was issued in February, 1839, in part 10, on the back wrapper of which it is listed as *Fritillaria Thomsoniana*; the corresponding letter-press (under the name *Fritillaria Thomsoniana*) was issued in 1840 in part 11. It would appear that the plate was originally lettered *Lilium Thomsonianum*; then, following David Don's decision that the plant depicted belonged to the genus *Fritillaria*, the word *Lilium* was erased from the plates already printed and

³For dates of publication of De Candolle's "Prodromus," see Stearn in Candollea 8: 1-4. 1939, and in Jour. Bot. 79: 27. 1941.

coloured and the word *Fritillaria* was written in its place, the final *m* of *Thomsonianum* being likewise erased and the *u* converted into an *a*; for later issues the name *Fritillaria Thomsoniana* was completely lithographed anew. The copies at Kew and the Arnold Arboretum seem to have escaped correction. The plant is now referred to *Notholirion*, a genus intermediate between *Lilium* and *Fritillaria*; see Grove and Cotton, Suppl. to Elwes, Mon. *Lilium*, p. 129. 1940.

Royle was born at Cawnpore in 1799 and educated at Edinburgh. He was appointed assistant surgeon on the Hon. East India Company's Bengal establishment in March, 1820, became curator of the Saharunpur Botanic Garden in 1823, and retired to England in 1831. From 1837 to 1856 he was professor of *materia medica* at King's College, London. Economic Botany, as the pages of his "Illustrations" abundantly testify, was his ruling interest, and he played a part in extending the cultivation of tea and cotton in India. Bentham, de Candolle, David Don, Hooker, and Lindley helped him with the classification and naming of his material. From 1851 until his death in 1858 he was secretary of the Horticultural Society of London.

LINDLEY LIBRARY,
ROYAL HORTICULTURAL SOCIETY,
LONDON, ENGLAND.

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1943

As in the preceding two years, because of war conditions and the concomitant unsettled economic situation, no special appeal was made for extra-budgetary support; yet the total gifts to the Arboretum were impressive, including \$925.00 for publication, \$2346.27 for general unrestricted purposes, \$1050.00 from the Committee for Inter-American Artistic and Intellectual Relations, to cover the expenses and emolument of Dr. Armando Dugand, Director of the Instituto Biológico of Bogotá, and a grant of \$500.00 from the American Philosophical Society for my use in connection with the study of our accumulated collections of Chinese material. In connection with the botanical survey of the Alcan Highway, discussed below, Dr. H. M. Raup received a grant of \$1500.00 from the Milton Fund of Harvard University, supplemented by a grant of \$500.00 from the Bache Fund of the National Academy of Sciences and one of \$600.00 from the General Purpose Fund of the American Academy of Arts and Sciences. The latter organization also granted \$150.00 to Professor Rehder for his use in connection with the completion of his bibliographic index. Five hundred dollars was received from the War Department to enable us to prepare the necessary illustrations for a treatise on emergency food plants for the Old World Tropics. An important gift to endowment was the receipt of \$50,000.00 in December from Miss Louisa W. Case of Weston, together with her estate in Weston, consisting of 59 acres of land with the buildings thereon, assessed at \$84,000.00, but actually valued in excess of that figure, for the buildings alone are insured on their appraised value of \$114,450.00. This gift is a memorial to her father, Mr. James B. Case. While under the terms of gift the Weston property may be sold after a period of three years and the proceeds added to the James B. Case fund, it is our hope and desire that the Case estate be developed and maintained as an adjunct to the Arnold Arboretum. The annual accretions to capital under the terms of gift of the James Arnold and Charles Sprague Sargent funds were credited to these funds as usual. The James R. Jewett and the Vieno T. Johnson prizes were awarded in August in accordance with the terms of gift.

In passing, the badly overcrowded condition of the library, and especially of the herbarium, is again mentioned, although the library situation has been somewhat alleviated through the transfer of certain forestry periodicals to the Harvard Forest at Petersham on deposit. The overcrowded herbarium situation can be alleviated only by additional construction, and even if funds were available for this purpose, which is not the case, an addition to the Administration Building could not be accomplished at this time because of the present restrictions on building material.

Staff. — The staff remains about the same as in the preceding year, only one member of the technical staff having been drafted for military service, this being Dr. C. E. Kobuski, who was granted leave of absence when he was inducted into the service in October. Dr. F. P. Metcalf resigned in April, 1942, when he was commissioned in the United States Army. Dr. Armando Dugand, Director of the Instituto Biológico of Bogotá, Colombia, was appointed Research Associate during the period that he was in the United States under the auspices of the Committee for Inter-American Artistic and Intellectual Relations, September 1, 1942 to March 1, 1943.

Instruction. — Several staff members continue to coöperate with the Division of Biology of Harvard University in offering undergraduate and graduate courses and in supervising the research work of candidates for advanced degrees. The number of graduate students has decreased because of war conditions, but the demand for certain types of undergraduate instruction has increased to provide for the needs of special groups of students in residence at Harvard under the auspices of the Army and the Navy. To meet this situation we have waived the condition of a half-unit course every other year on the part of our staff members, and for the duration of the present emergency our staff members may be called upon for more course work supervision than would normally be the case.

Buildings and grounds, including horticulture. — Normal maintenance of all buildings has been provided for, the most important items being essential furnace repairs and the installation of a new pipe line from the water main on the Arborway to the Administration Building.

In assimilating large collections of living plants from various parts of the world, it becomes necessary from time to time to re-check the living plants already in cultivation to detect duplications, as well as those which are incorrectly named. This was done with the lilacs last year, and this year the difficult genera *Weigela*, *Philadelphus*, *Deutzia*, and *Rosa* were carefully examined. In many cases it was found that we were growing far too many duplicates, and in an equally large number of cases it was found that, on examining and comparing the horticultural varieties in flower, many supposedly different varieties were identical, even though they had been received from widely separated sources and had been growing here for many years under different names. The checking and re-identification of these groups took considerable time, but it is necessarily one of the important functions of an arboretum. At present the number of species and varieties of these groups represented in the living collections is *Deutzia* 63, *Philadelphus* 103, *Rosa* 241, and *Weigela* 56.

During the past year, 576 different kinds of plants were transferred from the nursery to the living collections, many of these being entirely new accessions. Including desirable duplicates, a total of 826 living plants was added during the current year. In addition, approximately 300 crab apple

and oriental cherry seedlings were planted in the field near the Palmer house and in the Walter Street tract.

Included among the many new plants added to the collections this year was a collection of *Clematis* hybrids, the gift of Mr. Louis Vasseur of Milton, Massachusetts. Mr. Vasseur has specialized in the growing of *Clematis* hybrids for years and gave the Arboretum sixty of these in the fall of 1942. These were planted on the six-foot woven wire fence at the rear of the *Aesculus* collection. Another large collection of named varieties of *Clematis* was given by the James I. George Company of Fairport, New York, specialists in *Clematis*. These were planted in the nursery in the fall of 1942 and came through the cold winter remarkably well, but since that time many of them have unfortunately become seriously infected with disease.

The past winter was unusually severe, with temperatures at times well below zero. While there were only six days when the temperature fell below zero, as registered at the Arboretum greenhouses, more winter injury occurred to plants than at any other time since the severe winter of 1933-34. A detailed discussion of the winter injury and the species and varieties injured is included in *Arnoldia* 3: 25-36. 1943.

A survey was made of all the crab apples being grown in North America at the present time, in conjunction with a committee of the American Association of Botanical Gardens and Arboreta, of which Dr. Wyman was chairman. The study had as its objective the collecting of all available information about the crab apples being grown today and listing this information in convenient form together with complete bibliographical and source data. A greater part of the work was done in the collections of the Arnold Arboretum, and the report will be published in July, 1943.

During the year a total of 1713 living plants was received, chiefly from various parts of the United States, but including a few from Canada, and even three from England. In addition, 171 lots of scions and 59 packets of seeds were received. Distribution of material to other institutions and to individuals totaled 1542 living plants, 94 lots of scions, and an unrecorded number of seeds.

Under a policy inaugurated last year, approximately twenty of the larger nurseries in the United States and Canada were selected which were interested in new and rare plants and which were listed to receive living specimens of new and rare varieties grown by the Arboretum. These plants were not to be sold by the nurseries but were to be used as stock plants. This arrangement was enthusiastically accepted by the nurseries, thus insuring a properly controlled outlet for new or rare shrubs and trees of ornamental value. The first year of operation proved to be highly satisfactory to everyone concerned.

Due to the seriousness of the food situation, some of the experimental land and some of the nursery space was assigned for garden work to twenty-seven staff members and to individuals working in neighboring institutions, and one area to a Boy Scout troop.

At the James B. Case estate in Weston, mentioned above, one hundred

and thirty crab apples and oriental cherries were planted late in 1942 in one of the large fields and over 200 trees and shrubs were established in a nursery. The grounds are being maintained in good condition, and it is hoped that this estate may be maintained and developed as a permanent adjunct to the Arboretum, near the city, yet remote enough to enable us to accomplish various types of work without interruptions entailed because of the urban location of the Arboretum proper.

The Arboretum has had its share of "war troubles," but the staff is trying to carry on as well as it can under the circumstances. The curtailment in gasoline and labor and inability to obtain new mechanical equipment and repair parts for old machines are the chief causes for conditions noted by the public. We are trying to maintain the grounds and the collections in good condition with the equipment and help available. At the present time there is no one in the mapping and labeling department, both the young men formerly employed for this work having left, one to engage in war work, and the other to join the Army. Because the actual mapping work was completed, it is possible to let some of the routine remain dormant a year, but it does create many difficulties, some of which are unforeseen. However, the difficulties encountered in the maintenance of the living collections, though very real to us, are of the general type encountered everywhere during these unsettled times.

The War Effort. — This is not a discussion of war problems that the institution faces because of shortages in labor and materials due to war conditions. At first sight it would seem that a botanical institution could contribute little to war purposes, and yet what we have been able to accomplish is of considerable significance. Staff members have been at the service of both State and Federal governments in supplying horticultural and botanical information on camouflage problems, and a joint Camouflage Research Committee was set up consisting of staff members of the Arboretum, the Maria Moors Cabot Foundation for Botanical Research, the Harvard Forest, and the Biological Laboratories of Harvard University. The investigations undertaken by this group, in association with the United States Army Engineer Board at Fort Belvoir, were not competitive, but were coöperative, in that our investigations were supplementary to those prosecuted elsewhere. In addition to supplying special lists of plants suitable for camouflage purposes to the Army officials, a series of experimental studies on methods of prolonging the life of cut branches was initiated, and this was done with both native and exotic (European and Asiatic) species. Dr. Wyman has been a member of the Camouflage Committee of the Massachusetts Committee on Public Safety since its inception.

In addition to the camouflage investigation work, much time has been given to various emergency matters. Data have been freely supplied to officials in various branches of the armed services regarding poisonous plants and emergency food plants. In September, through the National Research Council, because so many conflicting agencies were becoming

interested in the problem, I was drafted to prepare for the Quartermaster's Department, United States Army, a treatise on the potential food and poisonous plants of the Old World Tropics. Work was commenced on this about September 15, 1942, and the completed copy, with illustrations, was sent to Washington on January 15, 1943. It was issued April 15, 1943, in a very large edition, as Technical Manual 10-420, under the title "Emergency Food Plants and Poisonous Plants of the Islands of the Pacific," pp. 1-149. fig. 1-113. It covers all of Polynesia, Melanesia, Malaysia, and the Philippines, and for all practical purposes all of tropical Asia. In addition to special work in this field I have had to go to Washington every two months to lecture on the same subject to each incoming group of trainees in the intensive course on tropical medicine at the Army Medical School.

Botanical Survey of the Alcan Highway.—In the early part of 1943, with the announcement of the opening of the Alcan Highway, it occurred to me that here was a real opportunity to accomplish some productive field work in a hitherto little known area. I accordingly suggested to Dr. H. M. Raup, who had conducted eight botanical field trips in northern Canada, that it would be a good idea to plan for a trip along the Alcan Highway perhaps in 1944 or 1945. In preparation for such a trip Dr. Raup applied for a grant from the Milton Fund of Harvard University. After the application was made it developed that the Joint Economic Committee, Canada-United States, was much interested in having the botanical survey made at once, because certain data were needed by the local authorities now. The Committee took up the matter with the military authorities and secured not only the necessary permission but also their coöperation. The National Museum of Canada is also coöperating. As noted earlier in this report, the Milton Fund grant of \$1500.00 was made and \$1100.00 was received from other sources. It was then decided to add a glacial geologist to the group, and Dr. Charles S. Denny of Wesleyan University was selected. He secured the necessary permit to be absent from the University for the summer and further secured a grant of \$900.00 from the Penrose Fund of the American Geological Society to cover his traveling expenses. Still later the services of Dr. Donovan S. Correll were secured as assistant botanist, by providing funds to reimburse the Botanical Museum for his salary during the time he would be in the field. The party, consisting of Dr. and Mrs. Raup, their two sons, Dr. Correll, and Dr. Denny, left Boston on May 31, and is expected to return about the middle of September. Meagre reports received from the field indicate a most successful summer campaign.

Cytogenetics.—The plant breeding work has resulted in new and interesting types of *Forsythia*, lilacs, roses, and ornamental apples and cherries. Several dwarf or compact types of *Forsythia* appear to be of particular interest. Among the hybrid cherries, one of the segregates is a

semi-double-flowered form of the *Prunus subhirtella* type which is very hardy and which remains in flower for two weeks. Of the several hundred apple hybrids which have flowered, six have been selected for propagation and further testing. Polyploid forms of *Forsythia* and *Philadelphus* have been produced. One of the polyploid forsythias bloomed freely after the severe winter, which destroyed the flowers of most species. This plant has large flowers which are darker than those of the diploid species. The polyploid *Philadelphus* has large flowers but the petals are thick and they fall quickly. Seedlings of this plant may prove to be of value. Cytological work has been limited to the continued study of X-ray effects on chromosomes and on the viability of seeds and seedlings.

Wood Anatomy.—Professor Bailey and Dr. Nast have continued their collaboration with Dr. Smith in the study of woody ranalian families. Intensive investigations of the floral and vegetative organs of the Degeneriaceae and Himantandraceae have shown that these families are closely related to the Magnoliaceae. The three families form a compact group within the Ranales, being more closely related to each other, on the basis of important morphological details, than any one of them is to other families. On the contrary, the Winteraceae exhibit no close relationship to the Magnoliaceae either florally or vegetatively. Nor do they exhibit close affinities to the Schizandraceae, Trochodendraceae, or other specific ranalian families. The remarkable carpels of the Winteraceae rival their vesselless wood in morphological significance. The palmately 3-veined megasporophylls are adaxially folded or conduplicate and bear numerous ovules on their morphological upper surface. In other words, the ovules are not attached to the margins of a classical, involute, sealed sporophyll. The conduplicate, open carpels of *Degeneria* and of the Section *Tasmannia* of *Drimys* afford significant clues for re-interpreting the carpillary structures of the Ranales, and in all probability of the angiosperms as a whole.

The Herbarium.—A total of 20,050 specimens was mounted during the year, and of these 16,476 were inserted into the herbarium; the remaining were herbaceous specimens not kept in the Arboretum collections. The herbarium now includes a total of 608,732 specimens.

The number of specimens received by exchange, gift, subsidy, purchase, or for identification was 22,585. The greater part of these — 17,519 specimens — was from North and South America, while the remainder may be broken down geographically as follows: from Polynesia, 3,477; from India, 976; from Australia, 314; from Africa, eastern Asia, and Europe, 299. Important acquisitions include about 3,000 specimens, mostly from Hawaii, collected and given by Mr. Otto Degener, 2,807 specimens collected in Cuba by Dr. Richard A. Howard, about 1,300 specimens collected in Idaho by Mr. Arthur Cronquist, 1,047 specimens collected in Mexico by Dr. C. H. Muller, 750 numbers, with duplicates, collected in Mexico by Mr. Robert Stewart, and 2,734 specimens obtained over a period of several years by

Mr. E. J. Palmer, representing cultivated plants growing in the Arboretum.

To other institutions the Arboretum distributed 36,152 specimens; these were necessarily all sent to American institutions this year. Of this number, 26,925 specimens were sent in exchange, while 8,896 specimens were transferred to the Gray Herbarium; the remaining specimens were sent out either as gifts or for identification by specialists. A total of 410 mounted illustrations was transferred to the Gray Herbarium and the Ames Orchid Herbarium at the Botanical Museum. Microfilm to the equivalent value of 1,916 specimens was distributed under a special exchange arrangement. The total number of specimens or their equivalent in mounted illustrations and microfilm distributed by the Arboretum, therefore, was 38,478. Additional thousands of specimens were set aside for shipment to European herbaria after the war.

Twenty-three loans, totaling 2,003 specimens, were made for study by specialists in 15 American institutions. For study by members of the Arboretum staff, 31 loans consisting of 2,280 specimens were borrowed from 12 institutions.

A total of 2,037 cards was added to the catalogue of references to new species and other important literature appertaining to woody plants, this catalogue now consisting of 133,732 cards. The collection of negatives representing types and other critical specimens now totals 4,211, as 73 negatives were added during the year.

Routine herbarium work has been continued under crowded conditions, only the most essential specimens being added to the general herbarium, and the less necessary material being stored in generic order in cardboard cases. Although this material is thus available to students, the need for additional steel cases and space to place them becomes more acute each year. Our accessions show a decrease from the figures of normal years, as expected under the present international conditions. Because of this decrease, the mounting department is now practically up to date. Herbarium work has included routine incorporation of clippings, typed descriptions, and illustrations.

Members of the herbarium staff continued their special studies, with the result that numerous technical papers were prepared for publication, while many identifications were made and various parts of the herbarium were better organized. Professor Rehder brought the bibliographical supplement to his Manual of Cultivated Trees and Shrubs nearly to completion, this comprehensive work so far based on the library resources of the Arnold Arboretum. There remain to be checked a number of references to literature not available here, to be searched for in other libraries. Dr. Smith, in collaboration with Professor Bailey and Dr. Nast, continued his study of ranalian families, also working on special groups of Papuasian, Polynesian, and tropical American plants. Dr. Johnston has continued his work on the flora of the intermontane plateau of northern Mexico, the first part of his report being published, the second part in press, and the third part now being prepared for the printer. Dr. Raup devoted much time to the com-

pletion of a report on his Mackenzie Mountain Expedition collections of 1939, which is nearly ready for publication, and to a study of *Salix* from the Hudson Bay and Labrador Peninsula regions. The latter is in press, but, because it became necessary for him to devote much time late in the year to preparation for the Alcan Highway trip, mentioned above, completion of the former must await his return from the field. Dr. Kobuski brought to completion his study of the tropical American members of the genus *Ternstroemia*, and was granted leave of absence for military service in October. Mr. Palmer continued to collect specimens of plants cultivated in the Arboretum, also carrying on his studies of *Quercus* and *Crataegus*. Dr. Allen's studies of the American Lauraceae were extended, especially of Mexico and Central America, and she continued her work on the genus *Halenia*. Dr. Perry has further studied the Papuasian collections assembled by the Richard Archbold Expeditions, and the greater part of this valuable material has now been determined and reported on in this Journal, although certain important groups are still under study. Dr. Croizat continued his studies of the families Cactaceae and Euphorbiaceae, giving special attention to the genus *Croton* in North and South America. Dr. Li studied and identified the material of many families of the large Chinese and Indo-Chinese collections accumulated at the Arboretum, preparing several papers for publication. My own work has been largely in connection with Rafinesque problems, especially the preparation of a comprehensive Index Rafinesquianus, now in rough draft stage and to be checked before the final copy is prepared. I have also supplied data on economic plants to various representatives of our armed forces and have worked with Dr. Li and Dr. Perry on Chinese and Papuasian botanical problems.

Linnaean microfilms. — A most important accession received in 1942 was a complete microfilm record of the Linnaean herbarium specimens and other natural history collections of Linnaeus, together with records of his manuscripts and of all books, including his own volumes, in which he had made marginal annotations. This important record, in the form of a positive microfilm, came as a gift from the Linnaean Society of London. I took some part in the negotiations with the Carnegie Corporation which resulted in a special grant to the Linnaean Society for the purpose of defraying the cost of making this record. The Council of the Linnaean Society, in applying for the grant, offered to deposit a complete microfilm record in some American institution. As a matter of fact, it generously sent two complete sets and later directed me to transmit one set to the Smithsonian Institution in Washington. There are about 160,000 exposures in each set.

For those parts appertaining to the herbarium material, we have had a new negative film prepared from the positive and have arranged to have enlarged prints made so as to have a graphic representation of each herbarium specimen. When the task is completed we will then be able to provide prints at cost to workers in other American institutions who may

have problems to solve in reference to the identity of Linnaean types. The films appertaining to the Linnaean types of shells, insects, fishes, and other animals have been deposited in the Museum of Comparative Zoology in Cambridge.

Bibliography.—Dr. Verdoorn edited volumes 8, 9, 10, and 11 of his new series of plant science books and vol. 7 of *Chronica Botanica*. As he has been in touch with the Botanical Garden at Buitenzorg, Java, since 1930, he has been giving part time service to the Board for the Netherlands East Indies, Surinam and Curaçao in Washington as botanical advisor, and in that capacity he organized the Central Depositary Library for the Netherlands East Indies in New York. The objective here is to assemble all foreign publications that normally would have been received by scientific and technical libraries in the Netherlands East Indies, the plan being to ship these to Java when conditions permit. In connection with the preparation of the *Index Botanicorum*, card indices to all literature dealing with botanical and horticultural history, bibliography, general biology, and the history of botanical gardens are being prepared. Some ten thousand references have been added to the standard forms on which information regarding individuals is being compiled, and these data have been carefully arranged for ready reference. Chiefly with the objective of gaining more time for historicobotanical investigations, *Chronica Botanica* will be discontinued as a serial and beginning with volume 8 will appear in book form. The first issue of a new series devoted to the history and methodology of botany and zoology is in press.

The Library.—At the end of the fiscal year the library contained 45,313 bound volumes, 13,322 pamphlets, and approximately 18,900 photographs. Accessions amounted to 191 volumes and 139 pamphlets. The cards added to the periodical and author catalogue numbered 550, of which 150 contained bibliographical information, and 700 slips were added to the files which supplement the printed author and subject catalogues of the library. About 250 volumes have been loaned to other libraries and many have been borrowed for use here, the University messenger service helping greatly in such exchanges. The demand for photostats and microfilms continued to be large, and prints of two of E. H. Wilson's collections of photographs numbering about 300 were made to order and sold. Exchanges of periodicals with foreign countries were even further curtailed due to the risks of shipping.

Atkins Institution of the Arnold Arboretum, Soledad, Cienfuegos, Cuba.—Because of war conditions and restrictions on travel this unit has been operated on a routine basis. It was not possible to assign graduate students to the Atkins Institution for tropical experience even on a fellowship or scholarship basis, partly because of the reduction in the number of graduate students at Harvard University, partly because of restrictions on

travel. During the summer and autumn of 1942, further transplantings were made in the palm section, and the temporary foot bridge across the stream was replaced by a more permanent causeway. Because of the unusually dry autumn and early winter, the reservoirs became dry, and advantage was taken of this to remove the accumulated silt. There was at this season an acute shortage of water, the small stream from which water is pumped becoming almost dry. Two springs in the newer parts of the garden were investigated, and this resulted in the development of excellent wells of clear water sufficient for the garden and house requirements. This, however, made it necessary to reorganize the pipe lines throughout the garden, which was in part accomplished. It is indeed fortunate that this additional source of water could be developed within the garden area. In the early spring some of the larger trees were transferred from the nursery to their permanent sites in the garden. Maintenance has been hampered because of lack of gasolene for the power mower. At the request of the United States Department of Agriculture, a nursery plot for *Hevea brasiliensis* was prepared and one shipment of 200 budded stumps was received from Costa Rica. This shipment was unfortunately delayed in transit, the resulting growth being poor. Over 400 pounds of *Cryptostegia grandiflora* seeds were supplied to the same organization and to the Bureau of Economic Warfare. Conditions being what they are, only 174 packets of seeds were shipped in exchange and 79 packets were received. The rainfall for the year was 49.29 inches, and the lowest temperature recorded was 45°, on February 24, 1943.

Publications. — The usual numbers of the Journal were published, the new and more compact format adopted at the beginning of 1942 permitting the publication of more material per number. The new publication *Sargentia*, the name honoring Dr. Charles Sprague Sargent, continuing the Contributions from the Arnold Arboretum, received an auspicious beginning with three numbers. The first of these, published in July, included Dr. Smith's study of the important Fijian collections assembled in 1940–41 by Mr. Otto Degener, on the Pacific cruise of the "Cheng Ho," sponsored by Mrs. Anne Archbold. In October Dr. Li's comprehensive monograph of the family Araliaceae in China was published. Number three, appearing in January, contained a revision of the genus *Sabia*, by Dr. Luetta Chen, and an extended discussion of the genus *Ormosia* in China and Indo-China, by Dr. Chen and myself. A fourth number of *Sargentia*, with articles by Dr. Raup and Dr. A. E. Porsild, is now in press. *Arnoldia* was issued as usual, and its mailing list was revised. A bibliography of the published papers by staff members and students follows.

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**Staff of the Arnold Arboretum,
1942-43**

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JOSEPH HORACE FAULL, Ph.D., Professor of Forest Pathology, Emeritus.

IRVING WIDMER BAILEY, S.D., Professor of Plant Anatomy.

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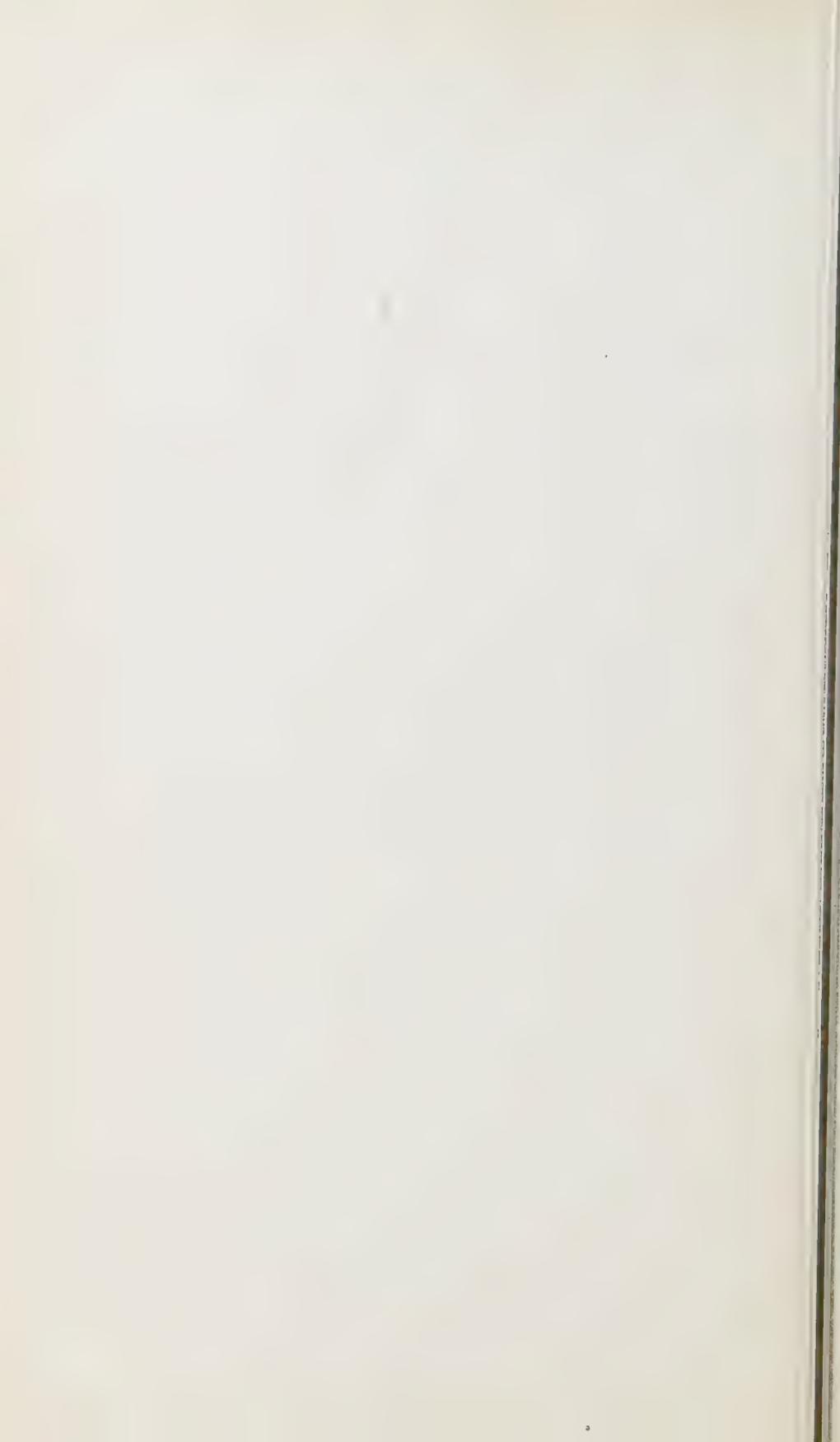
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LOUIS VICTOR SCHMITT, Superintendent.

WILLIAM HENRY JUDD, Propagator.

* On leave of absence for service in the U. S. Army.



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